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DIFFERENTIAL DIAGNOSIS

AND

TREATMENT OF DISEASE

A TEXT-BOOK FOR PRACTITIONERS AND ADVANCED STUDENTS

BY

AUGUSTUS CAILLÉ, M.D.

Fellow of the New York Academy of Medicine; Member and ex-President of the American Pædiatric Society; Professor of Diseases of Children, New York Post-Graduate Medical School and Hospital; Visiting Physician to the New York Post-Graduate and German Hospitals; Consulting Physician to Isabella Home and Hospital, etc.

WITH TWO HUNDRED AND TWENTY-EIGHT
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TO

THE MEMORY OF

ERNESTINE AND EMMA CAILLÉ

THIS WORK IS DEDICATED

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PREFACE

To bring the broad domain of practical medicine fairly within the grasp of the family physician, and to assist the advanced student in acquiring a clinical foundation has been my aim.

The general practitioner, representing the unity and connection of the various branches of medical practice, must grasp the practical details of his art in order to be useful at the bedside; and a book to be of value to the family physician should convey clinical experience without the exhaustive and often purely theoretical details to be found and sought for in monographs. Such a work I have endeavored to write.

It has been my desire to reestablish the relations of internal medicine, surgery, and the several specialties; for this reason I have presented specialistic methods from the view-point of the general clinician. Disease is neither medical nor surgical nor does it hover on the border lines, but the treatment of disease has become more surgical and the arbitary division into medical and surgical disease is no longer tenable. This unitarian principle should not be ignored in the presentation of disease, and many methods of diagnosis and treatment originally worked out by the specialist have become, or should become, common property.

Drugs no longer dominate our therapeutics; therefore the prominence given to hygienic, prophylactic, dietetic, hydrotherapeutic, and physical methods of treatment. At the same time well-tried and valuable formulæ are distributed throughout the book.

In prescription writing the apothecaries' weight and not the metric system has been used. However, simple rules for converting one into the other are given.

The special chapters on the Technique of Diagnosis and Laboratory Aids, on Pædiatrics, and the various specialties, on diseases of the Osseous, Muscular, and Articular System, on Nutrition and Diet, on the Management of Dropsy and Effusion, on Massage, Vibration, Dry Hot Air Treatment, Poisons and Anæsthesia, it is to be hoped will not be an unwelcome addition to a book on practice. Each chapter is prefaced by a synopsis of its contents and by brief introductory remarks on the clinical pathology of its subjects.

In writing this book a lucid brevity in general diction has been the aim of the author.

The bulk of this volume is from the author's pen.

The chapter on Orthopædics was contributed by Dr. C. Jaeger, Chief of the Orthopædic Department of Vanderbilt Clinic, New York.

My brother, Wm. Caillé, D.D.S., is the author of the Essay on the Care of the Teeth. Dr. R. L. Loughran has contributed Instructions for Keeping Case Records and Accounts.

Dr. R. H. Halsey and Dr. H. B. Sheffield, both instructors in Medicine in the New York Post-Graduate Medical School and Hospital, have given valuable aid in preparing the chapter on Infectious Fevers and Dermatological Memoranda.

In revising some of the special chapters, the author has received helpful suggestions from Dr. T. M. Brooks, Professor of Histology and Pathology; Dr. G. M. Edebohls, Professor of Gynæcology; Dr. F. Torek, Professor of Surgery; Dr. G. M. Schlapp, Neurologist, Cornell University; and Dr. C. Mund, New York Ophthalmic and Aural Institute.

Dr. I. H. Berry has aided faithfully in arranging the manuscript, and my assistants in various institutions have helped to collect histories and original illustrations. The very excellent index is the work of Miss M. S. E. Carswell.

The author tenders appreciative thanks to all who have aided in this undertaking. To the publishers, thanks are due for their unvarying courtesy and hearty cooperation during the preparation of the work.

AUGUSTUS CAILLÉ.

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INTRODUCTION

To be able to recognize the clinical form of disease and to aid nature in its reparative endeavors is the aim of the physician. The time was, and it is within the memory of many of us, when the family practitioner was the trusted family counselor in all matters concerning health and sickness. Before the advent of antisepsis and specialism and the acceptance of the germ theory in medicine, every mature and successful practitioner was the authority for his clientèle. Disease was looked upon as a visitation of Providence, the belief in the virtues of drugs and medicines was absolute, and surgery was brutal and simple.

At the opening of the twentieth century no profession stands in a more advanced position than that of medicine. General and local anæsthesia, asepsis and antisepsis, chemical and bacteriological research, with subsequent therapeutics on entirely new lines (serum and organotherapy) have opened up vast diagnostic and therapeutic possibilities.

Anæsthesia, antiseptic wound treatment, and antitoxines have reduced the sum total of pain and misery. The introduction of cocaine has been followed by a rapid development of the nose and throat specialty and has made the work of the time-honored ophthalmologist easier. Bacteriology and chemical research have given to all departments in the practice of medicine a marvelous diagnostic precision, complexity of terms, and an avalanche of literature which have completely swamped the all-round medical man, and make it difficult for the special worker in medicine to keep abreast of the times and events.

Owing to the great strides which practical and theoretical medicine have made in the past twenty-five years, the position of the general practitioner to-day is a peculiar one. He has found it impossible to keep abreast with the rapid progress in medicine; any young specialist feels himself his superior in his particular line, and, in our large cities, among the wealthy class, the general practitioner finds himself little more than "master of the ceremonies" —the diagnosis and treatment are furnished by the various consultants and the patient is handled by the trained nurse.

These matters have been discussed at various times and from divers standpoints, but no definite and precise advice has been formulated for the guidance of the student, or prospective student, or young practitioner, who in his enthusiasm for the study of medicine fails to take into consideration the great difficulties which beset him in the practice of his chosen profession.

It may not be out of place (before analyzing the future prospects of the family practitioner) to answer the question "To what extent shall we encourage young men and women to take up the practice of medicine as a livelihood?" To judge from the large number of medical men who are yearly let loose upon the public, it would appear that medicine is looked upon as a very promising field for reward, in fame and riches. Such an assumption is, however, not warranted by existing conditions. The law of supply and demand is inexorable, and we may have an overstocked profession just as we may have an overstocked market in flour or cheese.

Owing to the fact that many have entered the medical profession from impulse or fancy, the production of medical practitioners has been far ahead of the demand, and although an increase in population and the dropping out of the old members of our profession will make room for newcomers, there will certainly not be room for all who are clamoring for admission to its ranks. To my mind no one should attempt to enter upon such a career without a good physical constitution, a sound mind, a tactful disposition, and a thorough appreciation of the situation which confronts him, a full understanding of the difficulties to be overcome, and the hard work and drudgery to be endured by the general practitioner, be he successful or not. Competition is a stern master; it elevates and degrades, and the position of the medical man who in the battle of life has lowered his standard of honesty and loses his self-respect by reason of practices unworthy of a gentleman and a true physician is a deplorable one, be the money reward small or great.

Is there a place in society for the family practitioner, and if so, under what precise conditions will he be in demand?

I firmly believe that the family practitioner is not doomed to become extinct and that in due time the people will again elevate him to the position of trusted family counselor, and this opinion I hold for two reasons principally.

In the first place, many intelligent people who are fortunate enough to have the services of a thoroughly good family practitioner have refused to give him up and have upheld the dignity of his position on every occasion where the counsel and services of a specialist were in demand; and in the second place the public has already experienced the many and serious drawbacks of an indiscriminate consultation with immature specialists whose advice, if followed, has in many instances been bought more dearly than by dollars and cents.

Much of the specialist work of to-day is worthy of the highest praise; on the other hand, a large percentage of operative work is ill advised, superfluous, and harmful, and as soon as the more intelligent people of the community realize that such is the case they will again turn for advice to the intelligent family practitioner; they will admit him again to the inner family council and trust to him to shield them from the meddlesome treatment of our times and deliver them into conservative and safe hands. And if the future family practitioner is to regain lost ground, again aspire to reach that plane in the practice of general medicine which is properly his, and again enjoy the full confidence of his clientèle, it must be *through his own individual efforts* by educating himself to become a *diagnostician*. In view of the complex characters which are features of some of the special examinations, this may seem a herculean task, but I am convinced that all medical men who are fitted by nature and proper education for their work, will in reasonable time become competent diagnosticians and will be capable of formulating precise indications for treatment, provided ample opportunity for laboratory and bedside instruction be offered and sought, and provided that no time be wasted experimenting with thousands of old and new and useless drugs in the endeavor to adapt a complex, cumbersome, and largely superfluous materia medica to the various symptoms of acute and chronic illness.

The general practitioner must be: 1. Master of physical diagnosis. 2. He must have some laboratory training, particularly if he practises far away from laboratory facilities. 3. He must be able to make a local or regional examination, employing such of the methods of specialists which have become general property. 4. He must have a good knowledge of hygiene and dietetics. 5. He must be able to practise minor surgery and be able to perform emergency operations. 6. Whenever feasible, obstetrical cases should not be handled by the general practitioner.

A thorough training in physical diagnosis is the basis of a successful medical career. Once properly learned, it is never forgotten, and as long as we are in active practice, auscultation and percussion are and should be our daily routine work.

The various orifices of the body are accessible to the finger (touch), or, by means of simple instruments or specula, they are accessible to sight, and it is certainly lack of energy and self-confidence if the general practitioner fails to make use of ordinary local examination methods which may have been first introduced by the specialist, but have long ago become public property.

The intelligent layman will understand that the family doctor may not be prepared for a thorough ophthalmoscopic or cystoscopic examination, but why he should require other men to look into the mouth, nose, throat, and other regions, or to siphon out the stomach contents, and send fluids and blood to the laboratory for examination, is something he will not understand, and if he finds from experience that for local examinations a double fee will be entailed—that of the family doctor and that of the specialist—he will soon come to the conclusion that he may as well go to headquarters at once without consulting the family doctor at all. Things are very different when a patient is sent to a specialist for a corroboration of diagnosis or opinion. Two heads are sometimes better than one, and in obscure or serious cases a medical man will not suffer in the estimation of his patient if he requests the counsel or services of a professional colleague.

Under all circumstances the general practitioner should direct his energies *to making a diagnosis himself and formulating precise indications for treatment.* His patients will understand that he can not be a Jack of all trades and perform everything, but they will expect him to make a diagnosis and suggest proper treatment.

The attendance upon obstetrical cases has always been one of the duties of the general practitioner, and medical men have felt that from the first successful confinement case in a family dates the firm position which they may have eventually held as the family attendant.

Now, there are two reasons why the general practitioner should not as a rule attend obstetrical cases. The minor reason is that such cases usually involve night work, and a physician who works from 8 A. M. to 10 P. M. should go to bed and sleep unless called out by some serious emergency case. Life is short and we are entitled to some creature comforts. The important point is, that a general practitioner is at all times in contact with contagious or communicable disease and may, in fact does, infect parturient women. The more intelligent women in city practice will readily accept the services of an obstetrician other than the family doctor, if it is made clear to them that they escape the dangers of childbed fever and its sequelæ by such management. Among the poor people a well trained midwife who knows how to disinfect her hands is a safer attendant upon a woman in labor than the general practitioner who comes from a case of scarlet fever or erysipelas and is for some reason or other always in a great hurry and prone to help things along by the aid of his forceps.

This field properly belongs to that class of practitioners whose chief work is obstetrics, to which almost all their time must be allotted to do full justice to their cases.

How far such an arrangement might be possible in country practice remains to be seen.

This hurry and bustle in the life of the general practitioner is all wrong and for the safety of our patients is bad.

The general practitioner must fight against and not encourage the hysterical activity of our times. He should give time and thought to his cases, and his fee should be in accordance with the time spent and with the circumstances of the patient.

As things stand to-day the general practitioner is not sufficiently paid for his services and is compelled to see more patients than is proper *or safe*. An overworked brain is responsible for such sins of omission as are occasionally laid at the door of medical practitioners. Sins of commission are not frequent. The remedy lies more with the people than with the profession. A "fussy" doctor who turns a household upside down on every occasion of illness, severe or trivial, is a very popular person among a certain and large class of people who delight in boring their friends and acquaintances with the harrowing details of their latest sickness and miraculous escape from sure death. Physicians are needlessly called out at night; they are not sufficiently paid, and a proper understanding of the situation by our patients would do more to set the pace of the doctor than anything else.

To counterbalance the deficit which must result from the loss of fees for obstetrical work, the general practitioner will have more time to devote to himself and his family, and more time and ambition to practise *minor surgery*. Minor surgery, in my opinion, belongs to the general practitioner. The practice of minor surgery is easy and it is more impressive to the laity than the writing of a prescription for a lot of useless and superfluous drugs. *A general practitioner without surgical training and tendencies is handicapped from the very start.* As he is brought into early contact with cases requiring surgical aid, his timely recognition of the case and use of the knife will be of the greatest importance and value in cases which, if seen at a late stage by the special surgeon, frequently necessitate extensive surgical interference. Local and general anæsthesia have robbed surgery of much of its brutality. The knife in conservative hands aids nature and frequently gives prompt relief from pain and dangerous symptoms, and it is for this reason that surgeons get large fees for small operations and the timid general practitioner gets little or nothing. Disease does not run its course as purely *medical* or purely *surgical. Such a division does not exist in nature.* Rheumatism, typhoid fever, tuberculosis, pneumonia, diabetes, and a host of other so called medical diseases often present complicating features requiring surgical knowledge and interference, which the general practitioner will detect or remedy in good time if he has the necessary and proper education, and vice versa, purely surgical cases frequently develop non-surgical complications. Thus the Simon-pure prescription-writer has no future in the modern practice of medicine, and the medical man or woman who does not care to handle the knife should drift into a mild, bloodless specialty. Just how far the general practitioner may go in the practice of surgical handicraft will depend upon the taste and fancy of the individual. Every man will know his limitation and will do well to call in a special surgeon in cases requiring strict asepsis and in cases of a graver nature.

For small towns or in country practice I should advocate that neighboring general practitioners combine for the purpose of assisting one another in cases of minor surgery, emergency operations and the like, and trained nurses should be encouraged to locate in small towns for the purpose of aiding the medical men by making the usual preparations for operation and by nursing such cases after operation. I would suggest that a nurse who has been taught massage, diet kitchen work, and obstetrical nursing, in addition to ordinary nursing, should be encouraged to locate as above, and I feel that such a one would often get into a greater sphere of usefulness than by remaining in the large cities with their competitive overcrowding. I regard it as essential that the rural community should be educated as to the necessity and desirability of such services.

Another point of great interest to the general practitioner is the laboratory work (clinical microscopy and chemical research), without which no one can practise medicine with comfort to himself and his patients, because it is necessary for correct diagnosis. The microscope shows us a series of specific microorganisms, also changes in tissues and blood; and pathological changes in digestive and eliminative organs may sometimes be inferred from a clinical examination of various secretions.

But it must not for a moment be inferred that the general practitioner must do all this work himself, for this would be an impossibility. *Fine laboratory work is a speciality in itself,* and all that is required in this line of the practical physician of to-day are the very gross urinary, blood, and sputum tests, and stomach contents tests which can be made in short order. Everything else should go to the laboratory to be examined by experts, and patients should be told that a fee for laboratory work will be asked. In large cities, laboratories have been established by private enterprise or in connection with the medical schools and hospitals, and for the general practitioner it is no more necessary to have a private laboratory than it is to have his own drug shop or his own livery-stable. As a matter of expediency and convenience all ordinary simple examinations can be made as heretofore in the office.

We can not with good grace dismiss the general practitioner and his requirements without speaking in plain language in condemnation of the drugging habit of which he is still guilty to a remarkable degree. Cabalistic prescriptions are still as thick as flies in summer, and the majority of our patients pay willingly and handsomely for our wisdom transmitted to them in the shape of nauseating mixtures from the time-honored shelves of the apothecary shop.

I know from personal observation that our cousins across the water do not prescribe or swallow one quarter as much medicine as we do in our country. With but few exceptions the entire vegetable and mineral kingdoms have given us little of specific value, but still up to the present day the bulk of our books on materia medica is made up of descriptions of many valueless drugs and preparations.

Is it not to be deplored that valuable time should be wasted in our student days by cramming into our heads a lot of therapeutic ballast, and is it not true that such teaching is to a large degree responsible for the desire on the part of the many practitioners to prescribe frequently and without good cause an unnecessary quantity of useless drugs?

Every few weeks new drugs and combinations of medicaments are forced upon physicians with the claim that they are specifics in the treatment of disease, and the physician in his anxiety to alleviate his patients' sufferings, because the simpler and more reliable have failed him, is gulled into trying the newly extolled remedy, only to find that it is still less efficacious than the old one.

The common sense practitioner knows by experience that the constant frequent prescribing of innumerable drugs only ends in detriment to his patients. A working knowledge of hygiene and dietetics, climate, hydro- and mechanotherapeutics, simple medication and few drugs are the successful agents in internal medicine, and *the sooner the physician will condense his pharmacopœia and materia medica to a vest pocket edition the sooner will his efforts meet with success in the practice of his profession, and the sooner will Christian Science delusions disappear from the surface.*

There is still one point which must be discussed and that is: How shall the general practitioner keep up with the progress of our art?

Here again the city colleague has an advantage over the country practitioner, inasmuch as he lives all the time in a medical atmosphere of Hospital, Dispensary, College, Clinic, and progressive and representative medical men. If the country practitioner would keep abreast of the time, he must in addition to reading a few thoroughly good journals, take a postgraduate course as often as his time and circumstances will permit. All honor to the men and women who leave their work and travel hundreds and thousands of miles for postgraduate instruction. No other profession can boast of more unselfish and honorable instincts than are shown by the rank and file of the medical profession in a search for the best and most advanced knowledge in the practice of the healing art.

Hospital and dispensary material is not utilized for the purpose of instructing as it should be. The best hospitals are teaching hospitals, and the best place to obtain postgraduate instruction in medicine is in a teaching hospital which offers bedside instruction all the year round. In addition to the position of internes in hospitals there should be a system of externes, or matriculates, with a term of service of from three to six months—to act as junior assistants or dressers and thus to be brought into intimate contact with the vast material of our large institutions. Our city hospitals should have a country branch with a large corps of dressers and assistants for the treatment of subacute and chronic cases and convalescents. It is love's labor lost to keep medical and surgical cases longer in the wards of a city hospital than is necessary. Convalescents need sunshine, good air, exercise, hydrotherapeutics, and the like. Well to do convalescents go to the mountains and seashore if convalescent from acute illness. It would cost less to treat poor convalescents in the country, and give better results. The tendency to erect costly and elaborate hospital buildings in the city is in many instances a concession to our love of outward show and splendor.

I would venture to express the opinion that all medical men should start as general practitioners. If for any reason whatsoever they find it advisable to practice a specialty, they will be more generously informed and better equipped in every way by reason of years of general practice and experience. I predict that the successful general practitioner of the future will be a diagnostician, sanitarian, and minor surgeon, and after years of active practice such a general practitioner will develop into a valuable and conservative general consultant.

Just as the old temple of Æsculapius, held together by a cement of superstition and ignorance, has fallen, and a new temple is being erected, decorated with the magnificent works indicative of the progress of our times, so the old general practitioner with his obsolete methods and drugs is bound to go—and in his place will arise the modern family practitioner, the diagnostician and sanitarian, who will find his way along the trails and paths blazed for him by the master minds of the past, right into the hearts and confidence of the people.

CHAPTER I

THE TECHNIQUE OF DIAGNOSIS AND LABORATORY AIDS TO CLINICAL DIAGNOSIS

THE TECHNIQUE OF DIAGNOSIS

SYNOPSIS: Introductory Remarks.—The Causes of Disease.—Diagnostic Inquiry, General Examination.—The Patient's Statement of his Case.—Anamnesic Data.—Miscellaneous Signs.—The Recognition and Grouping of Symptoms.—The Significance of Fever and Pain.—The Preliminary Examination of the Urine and Blood.—Regional Examination.—Examination with X Rays.—Transillumination.—Tuberculin Test.—Exploratory Puncture and Incision.—Examination under Anæsthesia.—Examination of a Comatose Patient.

INTRODUCTORY REMARKS

ALTHOUGH a certain amount of material success is possible in the practice of medicine by symptomatic management without a clear knowledge of clinical pathology, the physician who aims to practise the healing art to the best advantage of the patient and with some degree of personal comfort and satisfaction must be able to make a diagnosis.

To select the right path when so many intricate symptoms are present is assuredly not easy. The novice in woodcraft who endeavors to find his way through an unknown territory over hills and valleys and streams is bewildered in the same manner, and must be content at first to follow in the footsteps of the more experienced guide.

Modern diagnosis is based upon the *recognition of symptoms, regional landmarks,* and upon *laboratory research.* As diagnosis has become more scientific and exact, the art of medicine has become more practical, owing to the elimination of deductive reasoning. In place of the latter, laboratory methods, inspection, palpation, percussion, auscultation, direct view with specula, lens, and mirror; x rays, exploratory incision, and puncture have furnished countless diagnostic possibilities and enabled the practitioner to attain a high degree of precision.

To establish a correct diagnosis may require days.

Systematic investigation, practice, and experience soon make quite easy a task which at first appears difficult, so that he who is fitted by nature to act as a medical adviser will in time learn to think and act for himself. It should be the aim of every general practitioner to become a good all-around diagnostician; and, if he fails in this, let him drift into a specialty.

THE CAUSES OF DISEASE

Deviations from normal functions and structure are inherited or acquired. Hereditary transmission may be temperamental, functional, or structural. This includes that imponderable quality known as hereditary predisposition.

Acquired ailments are the result of traumatism (injury), parasitic invasion (infection), intoxication, underfeeding and overfeeding, exposure to extremes of heat and cold, suppression of internal secretion, and nerve irritation and nerve fatigue from divers causes leading to and producing: Faulty metabolism, functional and reflex disturbances, or tissue changes and organic disturbances, ending in restitution to health or in death, at which time the animal body has completed the cycle of its destiny.

It is the duty of the physician: To educate the individual regarding preventive measures, determine the nature of an ailment, and look for and remove the source of irritation in functional or organic disorders, to aid nature in warding off and overcoming the dangers of acute illness, and relieve the suffering incident to progressive organic disease leading to dissolution.

Inasmuch as nature establishes a fair degree of tolerance as regards the discomforts incident to acute and chronic illness, very active symptomatic treatment, particularly in chronic ailments, is *unnecessary* and *often meddlesome* and *harmful*. It may not be out of place to remark that in estimating the health or disease status of the individual, we must ever bear in mind that a large percentage of persons of all classes come to the physician with *imaginary ills*, and that hysterical phenomena and malingering are very common. To a certain extent this assertion holds good even in children.

DIAGNOSTIC INQUIRY

GENERAL EXAMINATION

When a patient comes to us for advice, we make, in accordance with circumstances and the time at our disposal: 1. A preliminary examination. 2. A complete clinical examination.

Occasionally our diagnostic probing is handicapped by the comatose or delirious state of the patient, or we are compelled to anæsthetize him in order to be able to make a careful regional examination. Finally, it may be necessary to open the abdomen or other cavities or puncture a cavity, tumor, or organ in order to make an exact diagnosis and suggest and carry out proper treatment. Adults are best examined in bed or on a table with most of their clothing removed. Children should be completely undressed and examined in a good light on a table covered with a pillow or blanket.

Although the bulk of medical practice is made up of slight ailments, we must not forget that general symptoms are not pathognomonic and occur in slight ailments as well as in serious illness.

A diagnosis is made directly or by exclusion by taking into consideration the personal and family history of the patient, his subjective symptoms and complaints, the findings of a regional examination, and the findings of the laboratory.

In determining what a disease is, the physician must not go beyond the simple facts.

The Patient's Statement of His Case.—After a few friendly remarks for the purpose of putting the patient at his ease, we ask for a recital of the present illness and subjective symptoms and make direct or indirect inquiry as to its probable cause, manner of onset, duration, and previous management. In the case of young children the information is given by the parent. Older and intelligent children sometimes give a fair history if they are not frightened.

Anamnesic Data (to be brought out by the physician).—Name, age, sex, condition, occupation, nationality, residence.

FAMILY HISTORY AND PREVIOUS PERSONAL HISTORY, as to: Syphilis (chancre), gonorrhea, tuberculosis, cancer, rheumatism, gout, malaria, intemperance, insanity, injuries, menstruation, pregnancies, miscarriages, convulsions, diseases of childhood, and other diseases.

HABITS.—Tobacco, alcohol, narcotics, coffee, tea, exercise, environment, sexual desire, masturbation.

NUTRITION AND SUBJECTIVE SYMPTOMS.—Quantity and quality of food, breast or bottle fed, weight (stationary, gain, loss), condition of tongue, appetite, bowels, urinary functions, sleep, fever, pain, cough, vertigo, nausea, vomiting, and local symptoms.

For anamnesic data in nervous and mental diseases, see Neurological Memoranda.

Miscellaneous Signs.—The facial expression may indicate pain, anxiety, fear, alarm, vacancy, or stupidity, etc.; the face of impending death, of advanced pulmonary tuberculosis, of mouth breathers, of the "typhoid" status, of renal disease, (puffy eyelids, etc.); the facies of *dyspnœa* (pneumonia and pulmonary œdema), of asthma, of exophthalmic goître, of peritonitis, of hysteria.

CACHEXIA.—Anæmia, emaciation, and debility are the characteristics of cachexia from grave organic disease. The experienced clinician will recognize a cancerous, syphilitic, or malarial cachexia, or the cachexia strumipriva, a name given to the cachexia resulting from the extirpation of the thyreoid gland and characterized by an anæmic, myxœdematous skin and neurotic disposition.

DIATHESIS.—Clinical experience will enable us to speak of a tuberculous (scrofulous strumous), gouty (lithæmic), rheumatic, neuropathic, fatty, hæmorrhagic, and lymphatic diathesis.

The Recognition and Grouping of Symptoms.—After securing the anamnesic data in a given case of illness, we look for symptoms.

The multitude of symptoms deserve a word of explanation. They are not, as a rule, pathognomonic of a certain diseased condition, nor do they point to specific or distinct systemic disturbances, but are found in trivial as well as in serious ailments and are not in themselves the basis for conclusions, excepting in connection with regional examination, etc. Nausea, a coated tongue, and a general feeling of malaise may be due to constipation, or may usher in a tuberculous meningitis or some other infection. A cough is a prominent symptom in emphysema or membranous croup or it may be due to reflex irritation from a follicular pharyngitis, etc. The underlying cause of a supraorbital neuralgia may be syphilis, tuberculosis, or malaria, and so *ad infinitum.* Therefore, the treating of symptoms is an illusion and a snare.

For practical purposes we shall group the general symptoms according to the systemic or organic disturbance to which they point, viz.:

1. POINTING TO ORGANS OF DIGESTION: Loss of appetite, fœtor, coated tongue, bad taste in mouth, belching of gas, eructations, dysphagia, nausea, vomiting, local pain, "dyspeptic asthma," constipation, diarrhœa, flatulence, tympanites, jaundice, vertigo, headache, phosphaturia, etc.

2. POINTING TO ORGANS OF CIRCULATION: Pallor, cyanosis, flushing, œdema, pulsating swellings, dilated and pulsating veins, coldness of hands and feet, palpitation, throbbing sensations, arrhythmia of heart's action, dyspnœa, local pain, vertigo, circulatory or cardiac "asthma," syncope, collapse, etc.

3. POINTING TO ORGANS OF RESPIRATION: Sneezing, coryza, nasal voice, loss of smell, hoarseness, aphonia, cough, croupy cough, expectoration, hæmorrhage, dyspnœa, noisy respiration, pulmonary or respiratory "asthma," local pain, perverse sensations, etc.

4. POINTING TO GENITOURINARY AILMENTS AND THOSE OF THE FEMALE PELVIC ORGANS AND THE RECTUM: Retention, suppression, or incontinence of urine, vesical tenesmus, painful micturition, hæmaturia, pyuria, albuminuria, impotence, abnormal discharge, hæmorrhage, pain in penis or scrotum, dyspnœa or asthma of renal origin, etc. Bearing down pain in pelvis, menstrual anomalies, intermenstrual pain, leucorrhœa, etc., constipation, incontinence of fæces, rectal tenesmus, hæmorrhage, pain in rectum, abnormal discharges, etc.

5. POINTING TO ACUTE SYSTEMIC INFECTION OR INTOXICATION: General aching, headache, chill, fever, thirst, weakness, faintness, insomnia, vomiting, herpes labialis, convulsions, coma, etc.

6. POINTING TO NERVOUS AND MENTAL AILMENTS: Motor, sensory, trophic, and reflex disturbances, rectum and bladder and ocular phenomena, analgesia, neuralgias, tremor, tics, paralysis, paresis, convulsions, girdle sensation, abnormal gait, nervous asthma, mind wandering, forgetfulness, insomnia, somnolence, aphasia, polyuria, impotence, globus hystericus, delirium, hallucination, coma, etc.

7. POINTING TO DISEASE OF THE BLOOD: Anæmic appearance, purpura, hæmophilia, etc.

8. POINTING TO ORGANS OF LOCOMOTION: Pain, abnormal posture and gait, crepitation on motion, muscular rigidity or paralysis, articular rigidity or laxity and swelling, false points of motion, etc.

9. POINTING TO THE SKIN: Itching, burning, discoloration, eruption, and other visible manifestations, etc.

10. POINTING TO THE EYE: Disturbed vision, headache, eye fatigue on reading, burning sensation in lids, dizziness, photophobia, weeping and discharges, orbital and circumorbital pain, pink eye, etc.

11. POINTING TO THE EAR: Previous sore throat, pain and swelling in mastoid region, loss of hearing, pain in ear, noises in head or ear, discharges from ear, etc.

12. POINTING TO SEVERE CONSTITUTIONAL DERANGEMENTS AND GRAVE ORGANIC DISEASE: Loss of appetite, coated tongue, loss of strength and ambition, great loss of body weight, insomnia, appearance of cachexia.

The Significance of Fever and Pain

In order to make a comprehensive presentation of *clinical phenomena* the significance of symptoms will not be discussed in a separate chapter and from a diagnostic standpoint, but will receive attention throughout the book in connection with the various ailments. At present we shall consider only *Fever* and *Pain* as general phenomena which we may encounter in any and almost all forms of illness.

Fever.—The normal bodily temperature is 98° to 99° F. The rectal temperature is about one degree higher than that of the mouth or axilla. For taking temperature the clinical thermometer should be inserted into the rectum or vagina or under the tongue with lips closed. *The temperature record taken in the axilla is not reliable.*

To convert the Centigrade into the Fahrenheit scale we divide the Centigrade temperature by 5, multiply the quotient by 9 and add 32. To convert the Réaumur scale into Fahrenheit we divide by 4, multiply by 9 and add 32.

Fever is characterized by rise of body temperature plus a disturbed metabolism. A normal temperature is maintained by means of a complicated system of heat regulating apparatus the details of which are more of physiological than clinical import. An increase of body temperature is usually accompanied by a respiratory increase. In fever there is a contraction of surface capillaries; the skin cools off and the patient experiences a *chilly feeling, chills.* We also observe chills with fever temperature and a reddened skin with dilated capillaries. A nervous chill is unattended by rise of temperature. An increase of body temperature is usually accompanied by an increase of body oxidation, particularly albumin oxidation; and thus we find in the febrile state an increase of urea in the urine.

In the convalescent stage of acute infectious disease, the regulation of the body heat is liable to be disturbed by trivial causes. Thus, in typhoid convalescents a rise of temperature is observed when nourishment is taken in excess.

In order to produce fever by infection, bacteria or their products must enter the circulation. The same holds good for the protozoa (malaria). We have no definite knowledge regarding the purely nervous irritation of the heat centres. The predisposition to fever temperature varies with the individual and with his age and condition of the individual. This is a well known clinical fact. Young and strong individuals have a higher range of fever heat than the weak and aged. As a rule, continued high fever is accompanied by loss of appetite and inanition. Here, again, there are exceptions. The writer has known children and adults to have temperatures of 104° for over a week and still retain an excellent appetite.

Continued high fever is accompanied by structural change in the liver, kidneys, heart, and muscles. Frequently, a loss of body weight is not observed during the fever period, but is noticed during convalescence.

The significance of fever for the organism is still a mooted question. On the one side fever is looked upon as a direct danger, and, contrariwise, a high temperature is looked upon as favoring a limitation of disease conditions. Naturally, our therapeutic efforts will vary according to our personal conception of such conditions. At the present time we are still in the dark regarding these points and we do not exactly know whether a fever from an infection is favorable or unfavorable or of neutral importance to the animal economy. Thus our antipyretic efforts through hydrotherapy or chemical antipyretics may or may not be of value in a given case, but may be rational as favoring increased elimination through the skin, etc. Our knowledge regarding subnormal temperature is meagre.

The temperature is a very important aid to diagnosis. A fever temperature may mean very little, but it always means something, and should stimulate us to look for and, if possible, to find the cause. A single notation of temperature is not of much value in obscure disease, and it frequently becomes necessary to study the temperature curve extending over one, two, or more weeks. A daily remission to the normal usually excludes typhoid fever and speaks for malaria. *Unresolved pneumonia* and *tuberculous pneumonia* show a marked difference in the temperature curve. A sudden rise of temperature following an operation puts us on our guard for a complication. Mild abdominal symptoms and a low fever curve in children, in the absence of a painful appendix and of Widal's typhoid fever reaction, are suggestive of tuberculous peritonitis. Thus, in obscure cases, the patient, if not in a hospital or under the care of a trained nurse, must be taught to take and note his temperature several times a day. According to the writer's observations, adults and children with valvular heart lesions sometimes have a "normal" temperature of 100° F. In acute indigestion in children very high temperatures are observed, and some children show very high temperature from any slight cause. The term aseptic fever is sometimes employed by surgeons to designate a rise of temperature following an operation which can not be localized as to cause and which is unaccompanied by other symptoms of septic infection.

Clinically, high temperatures have been observed in tetanic muscular contractions, in infectious diseases, in insolation, and in lesions of the bulbocervical cord. In acute illness the temperature may be taken every four hours or at the time of a chill. In chronic illness once or twice a day is sufficient. The various types of fever—continued, remittent, intermittent, irregular, etc.—will be mentioned in their clinical relations to disease.

Pain; Tenderness; Paræsthesia; Headache.—Pain may be acute or dull or paroxysmal or shifting—gnawing or crampy or tenesmic or pulsating. It may increase by motion and disappear on firm pressure.

Pain, as a symptom in *children* and adult neurotics, is not always a reliable factor on which to base a conclusion. The cause or origin of a given pain is to be made out by the associated signs and symptoms. It is generally true that if we elicit tenderness in an organ that organ is disordered. It is important to note the character and the seat of pain. It must not be forgotten that we meet with many instances of pain quite remote from the seat of the trouble which produces it, i.e., children frequently complain of pain in the abdomen in pneumonia or pleurisy.

Pain in joints and muscles is easily made out on motion and is as readily simulated. Pain in vomiting and defæcation and urination or coughing is usually characteristic owing to posture and expression. The hydrocephalic cry is characteristic. Intestinal, renal, biliary, and appendicular colic, gastrointestinal neuroses and crises, and pains from intestinal worms and pelvic adhesions are not always easily distinguished from one another. The agonizing pain of angina pectoris is characteristic. Pain in the region of the heart or kidney is usually muscular. When children have pain in the ear they hold their hand to the affected side and the head is held in a strained position on account of indurated and painful lymph nodes behind the ear.

Certain forms of disease have characteristic points of pain on pressure, which are mentioned elsewhere.

The diagnostic import of the seat of pain can not be scheduled, but its exact location is very important in diagnosis. *Headache* is a symptom of *multiple origin* and deserves special mention. A localized neuralgic headache or pain is frequently of malarial origin, but may also be due to local irritation. A dull general headache and coated tongue are generally due to indigestion. Headache may be of reflex character and take its origin in any disturbance of the bodily functions—circulatory, digestive, respiratory, eliminative, or excretory. It may accompany acute and chronic infection or take its origin in the nervous system—from fright, in injury, from hunger or fatigue, from eye strain, from disease of the sexual organs, from nasal irritation, from bad teeth, or from anæmia or hysteria. Persons who live in overheated and ill ventilated rooms are subject to headache.

In *paræsthesia* there are subjective sensations such as formication, itching, bearing down, numbness, burning, cold and heat, girdle sensation, præcordial tightness and constriction, which will be discussed in their relation to special diseases.

The Preliminary Examination of the Urine and Blood.—After eliciting and grouping the symptoms in a given case of illness, we are ready to proceed with the special or regional examination in order to ascertain whether we have to deal with a structural or functional disturbance.

Before we begin our regional examination we should, if circumstances will allow, make a preliminary examination of the urine. This is of the utmost clinical importance. A qualitative examination of the urine for albumin, sugar, and bile can be made in five minutes, and the knowledge it imparts is like a guide post at a cross road—it points in the direction of a correct diagnosis.

A preliminary *examination of the blood* for *Plasmodium malariæ* in febrile disease is also important and enables us to inaugurate specific treatment if necessary without much temporizing. Whenever a blood examination can not be made immediately in a suspected case of " malaria " we may with advantage send out a " diagnostic feeler " in the shape of a brisk cathartic combined with quinine (the therapeutic test).

REGIONAL EXAMINATION

It is assumed that the practitioner and advanced student are familiar with physical diagnosis methods and with the employment of ordinary specula and instruments for regional examinations, *the use of which can not be learned from books*, without which knowledge no one is competent to make a regional examination.

A REGIONAL EXAMINATION IS FACILITATED BY GROUPING THE REGIONS AND ORGANS IN CONFORMITY WITH MODERN SPECIALISM, AND BY BEARING IN MIND THAT WE MAY CONSTANTLY MEET WITH MALFORMATION, INJURIES, ACUTE AND CHRONIC INFECTIONS AND THEIR SEQUELÆ, PARASITIC INVASION, AND AN UNLIMITED NUMBER OF REFLEX NEUROSES AND INTOXICATIONS FROM WITHOUT OR FROM WITHIN (BY REASON OF FAULTY INTERNAL SECRETION).

SPECIAL EXAMINATIONS

Examinations with Röntgen Rays are an established feature in medicine and surgery. X ray pictures, like all shadowgraphs, are apt to be deceptive and misleading. Stereoscopic or double ray prints are apt to give a clearer insight into the actual relation of the parts than plain shadowgraphs. In making an x ray exposure, every precaution should be taken to avoid burns. In lengthy exposures the tube must be from ten to fourteen inches from the skin and the latter may be anointed with vaseline.

Transillumination of organs and regions by means of condensed light occasionally gives definite results.

The Tuberculin Test, which is of inestimable value in detecting bovine tuberculosis, may occasionally be employed; but in the present state of our knowledge the writer does not advocate its routine employment. See also article on Tuberculosis of Lungs.

Exploratory Puncture and Incision are not performed often enough, and many a doubtful case could be readily cleared up by such a procedure under antiseptic precautions.

Other Examinations, such as an examination of a patient in a comatose condition, are extremely unsatisfactory as a rule. One should be very guarded in expressing an opinion in such cases, and emergency treatment is indicated without an exact knowledge of the underlying condition. See Coma.

Finally, cases will be met with in which the practitioner is compelled to anæsthetize the patient in order to clear up certain conditions. Hysterical contractures and stiff joints are thus detected, and a painful examination is made possible by the complete relaxation which anæsthesia affords. *When anæsthesia is employed for diagnostic purposes, the patient has a right to expect that the evidence to be elicited should be conclusive one way or the other.* For laboratory findings, see following chapter. When a positive diagnosis has been made the line of treatment to be adopted is self-evident, and it should be carried out on the principle of "non nocere." When the diagnosis is "in dubio," the treatment is naturally symptomatic.

CHAPTER I—*Concluded*

LABORATORY AIDS TO CLINICAL DIAGNOSIS

Synopsis: List of Apparatus and Chemicals.—Examination of Urine, Fæces and Entozoa, Gastric Contents, Sputum, Discharges, Exudates, Transudates, Puncture Fluids, Cyst Contents, Breast Milk, Cultures (Bacteria), Blood, Tissues, Calculi.—Drinking Water.—Remarks on Cytodiagnosis (cell diagnosis), Cytolysis, Hæmolysis, Cryoscopy.—Estimation of Renal Function by means of Phloridzin.—Directions for Preparing Specimens.

INTRODUCTORY REMARKS

The Laboratory is to the physician what the clearing house is to the business man. Laboratory work is necessary for correct diagnosis. The microscope shows a series of specific microorganisms, and also changes in tissues and blood. Pathological changes in the eliminative organs may often be inferred from a clinical examination of various secretions.

While fine laboratory work is a specialty in itself, the general practitioner must avail himself of such laboratory facilities as are at his command. As a matter of expediency and convenience the gross analysis of *urine, blood, sputum,* and *stomach contents* can readily be made, as heretofore, in the office. The value of laboratory reports depends upon the time, care, and knowledge employed in making them. In important cases the knowledge and technique of the observer must be beyond question, and the clinician must rank foremost in the final adjustment of therapeutic measures. In acute illness, however, the proper management of suspected disease should not be delayed until a laboratory report is obtained. Many death certificates have been written in diphtheria cases because the practitioner waited for a laboratory report before giving antitoxine.

EXAMINATION OF THE URINE

APPARATUS

Centrifuge.
Measuring-glass—graduated.
Urinometer.
Test tubes.
Litmus paper.
Filter paper.
Bunsen burner or alcohol lamp.
Pipettes.
Esbach's albuminometer.
Slides, plain and hollow ground, and cover glasses.
Saccharometer.
Doremus's apparatus for quantitative estimation of urea.
Burettes, pipettes, flasks, beakers, funnels.
Microscope, water bottle.
Platinum wire inoculator.
Graduated burette, with stand.
Porcelain dishes.
Tripod, with wire gauze for heating.
Thoma-Zeiss white blood cell pipette and counting chamber.

CHEMICALS

Nitric acid.
Nitric acid—fuming.
Acetic acid, 2 per cent.
Acetic acid, glacial.
Fehling's reagents. (Purchase ready made.)
  Cupric sulphate. Bottle No. 1.
  Rochelle salt. } Bottle No. 2.
  Sodic hydrate. }

Nylander's solution:

Bismuth subnitr.	2 parts
Rochelle salts	4 parts
Sodium hydrate (stick)	8 parts
Distilled water	100 parts

Stain for tubercle bacilli (Ziehl-Neelsen solution).

Fuchsin sat. alcoh. sol.	1.0
Carbolic acid, 5 per cent aq. sol.,	9.0

Loeffler's solution:

Methylene blue sat. alcoh. sol.	30.0
Caustic potash, aqueous sol., 1-10,000	100.0

Silver nitrate solution, 5 per cent.
Sodium hydrate sol., 40 per cent, and decinormal sol.
Eosin solution, alcoholic, 1 per cent.
Bromine, saturated aqueous solution.
Potassium hydrate sol., 5 per cent.
Hydrochloric acid, C.P. HCl.
Ether.
Chloroform, 30 per cent.
Sodium hydrate.
Potassium hydrate.
Gentian violet solution (alcoholic), saturated sol.
Ehrlich's diazo reagents. See page 24.

Esbach's solution:

Citric acid	20.0
Picric acid	10.0
Water	1,000.0

Cupric sulphate sol., 2 per cent.
Five per cent ferric chloride.
Iodine. Congo red.

A complete outfit of apparatus and chemicals can be obtained from large drug firms.

METHOD OF PROCEDURE IN EXAMINING URINE

Color.—Wide variation in normal urine. Usually amber colored, light or dark according to concentration. The presence of *blood* gives color from carmine to jet black, depending upon amount and upon changes which it may have undergone. *Bile* gives the urine color from greenish yellow to greenish brown. *Chyle* occasionally found in urine makes it milky. Poisoning from *carbolic acid* and its related drugs makes urine often smoky or black. *Salol* has been observed to make urine green. *Rhubarb* and *senna* may give a brown or deep red color. *Methylene blue* makes urine a greenish blue.

Odor.—Similar to odor of bouillon; more often it is aromatic. When undergoing fermentation or decomposition, it has an odor peculiar to itself—the so called "urinous odor," more often fœtid and frequently ammoniacal.

Turbidity.—May be due to *urates, phosphates, pus, epithelium, bacteria, casts,* and *chyle* in suspension. Persistent turbidity is almost always due to pus, most frequently it is due to bacteria; when due to pus alone, the urine becomes clear on standing, a greater or less abundant sediment being deposited. Elongated needles of monohydrated magnesium phosphates are sometimes found in the urine of persons who have taken magnesia internally. Phosphates are precipitated by heat and dissolve on the addition of nitric acid.

Consistence.—Usually fluid. Sometimes presence of pus and mucus render it thick and viscid. In chyluria the urine often coagulates.

Reaction.—Normally *acid,* intensely so in fevers and in certain diseases of the stomach where HCl secretion is diminished; in gout, lithæmia, acute articular rheumatism, chronic Bright's disease, diabetes, scurvy, leucæmia, etc.

Alkaline urine may exist under normal conditions immediately after the ingestion of a large amount of food or fruits. Persistent alkalinity indicates decomposition and usually cystitis. Some drugs—carbonates or organic acids—may render the urine alkaline.

Specific Gravity.—Determined by means of the urinometer and is very important, provided a twenty-four hour specimen is tested; otherwise it is of questionable value. Persistent *low specific gravity* is frequently observed in neurotic people, and does not necessarily indicate a chronic nephritis. *High specific gravity* is observed in concentrated urines such as occur in fevers, in acute nephritis, and *diabetes mellitus.* In *diabetes insipidus* the urine has a low specific gravity. The term *diabetes insipidus* is a misnomer, because it has no connection with true diabetes. The mixture of the whole amount of urine passed in twenty-four hours must be had in order to make a correct determination of specific gravity.

The amount voided in twenty-four hours is of importance. Normally, the average amount is from one to one and a half litres (40–50 oz.). Wide variations may exist in direct proportion to diet, weather, and nervous tension.

Chemical Tests

The urine should always be filtered before being tested.

Albumin.—*Heat and nitric acid test*: Boil one or two drachms of filtered urine in a test tube. If albumin is present a precipitate appears, insoluble in a few drops of nitric or acetic acid. Earthy phosphates are also precipitated by heat, but these dissolve on the addition of nitric or acetic acid.

Picric acid test: Overlay a small quantity of urine by a saturated watery solution of picric acid. If albumin is present, a deposit, insoluble on boiling, forms at the line of junction.

For an approximate *quantitative test* use Esbach's albuminometer.

A large quantity of albumin in urine sometimes causes the urine in the test-tube to solidify upon boiling. Albumin is at times present in urine physiologically; this is called paroxysmal (cyclic) albuminuria. A highly albuminous diet (e. g., eggs) may cause albumin to appear in the urine. After severe exertion it is often found; and sometimes it may persist in small amounts in the absence of apparent disease of the kidneys. The diseased kidney usually causes albumin to appear in the urine. All forms of acute and chronic nephritis may cause it to be excreted in considerable quantity. The amount depends upon the severity of the exudative process, the state of the blood, the venous congestion, and the condition of the capillary walls and renal epithelium. In chronic interstitial nephritis the albumin is low in amount and may frequently be absent for long periods. In periods of exacerbation, very large amounts may be excreted. In most febrile diseases, transient or continuous albuminuria may be observed and is referable either to an acute congestion and degeneration of the renal epithelium, or to an acute exudative nephritis. In typhoid fever, pneumonia, meningitis, ulcerative endocarditis, scarlatina, diphtheria, and smallpox, and all febrile diseases, also after convulsions, etc., traces are usually found. In yellow fever, it is often found twenty-four hours after the onset. It may occur in pernicious malaria, and is nearly constant in cases of irritant poisoning.

Peptone.—In the form of albumose, *peptone* is found in the urine in many pathological conditions. It is most marked and constant when there is an accumulation with more or less absorption of pus in the body, as in empyema, cellulitis, suppurative meningitis, resolving pneumonia, and suppurating cavities in phthisis; in ulcerative intestinal conditions, such as typhoid fever, tuberculosis, dysentery, and carcinoma. It also occurs in scurvy, pernicious anæmia, leucæmia, diphtheria, the exanthemata, acute yellow atrophy of the liver, pregnancy, and various nervous diseases (myelopathic albumosuria).

For a differential diagnosis, the presence of albumose in urine may be of great value to distinguish: 1. Between suppurative and non-suppurative processes, especially tuberculous lesions. 2. Typhoid and other ulcerative intestinal lesions from catarrhal conditions. 3. Exanthemata, diphtheria, etc., from simple fevers.

The general practitioner requires the aid of a laboratory expert to make these more delicate tests.

Test: *a*. Separate completely ordinary albumin by boiling faintly acid urine. Filter.

b. Take 50 c.c. of filtered urine, add 5 c.c. of concentrated HCl to acidify. Then add 2 or 3 c.c. of 10 per cent phosphotungstic acid until precipitate ceases to form.

c. Heat very carefully in a beaker over a wire-gauze flame until the precipitate becomes an ashy gray resinous mass. The fluid is then decanted and the precipitate washed twice with distilled water to free it from acid.

d. Add about 2 c.c. of distilled water and a few drops of 30 per cent solution of sodium hydrate to render it alkaline. Dissolve by gentle heat. If the solution is not colorless, add more alkali, drop by drop, while boiling. This fluid now contains a concentrated solution of albumose. The biuret test is now employed by adding one drop of a very dilute solution of cupric sulphate. The presence of albumose gives a brilliant amethyst red color.

Sugar is of significance in the diagnosis of diabetes mellitus. There is a transitory physiological glycosuria after the ingestion of a large amount of sugar, and traces are found when digestion is slightly disturbed. Disease of the pancreas and liver, some drugs, such as chloral hydrate, morphine, alcohol, and chloroform, may cause a slight transitory glycosuria. It is found sometimes during pregnancy, also in some nervous diseases, and in severe and fatal types of infectious diseases; also frequently after hysterical attacks, emotional excitement, and prolonged anesthesia.

Fermentation Test: A small piece of ordinary compressed yeast is shaken with some of the suspected urine and a test tube filled with the mixture, to which some mercury is added. The tube is then inverted into a vessel containing mercury and allowed to stand in a warm place (70°–80° F.). If sugar be present, fermentation will occur in the course of twelve hours, and the carbon dioxide formed will rise to the top of the tube, gradually expelling more and more of the urine or the mercury as the amount of the gas increases. As the yeast itself, however, may give rise to the formation of a little gas in the absence of sugar, as lactose, maltose, and levulose also undergo fermentation, and as the internal administration of mercuric chloride, iodoform, salicylic acid, quinine, and other antiseptic drugs may stop the fermentation, the test is of value only as a control-test.

Precautions :

1. Urine must be faintly acid.
2. Urine should be diluted so that its specific gravity is approximately 1008. Allowance must be made in result by multiplying by corresponding factors.
3. Urine should not contain above 1 per cent glucose.

Fehling's Test is probably most used. There are two solutions. Take equal parts of each solution in a test tube, and dilute once with water. Boil, add a few drops of urine, and boil again. Sugar gives a brick-red precipitate. Inasmuch as there are other organic compounds which precipitate the cupric sulphate in Fehling's solution, a control fermentation test should be made; or, for a *qualitative test,* boiling with potassium hydrate solution seems to be preferable. Urine changes from canary yellow to dark brown, according to amount of sugar present if boiled with this solution.

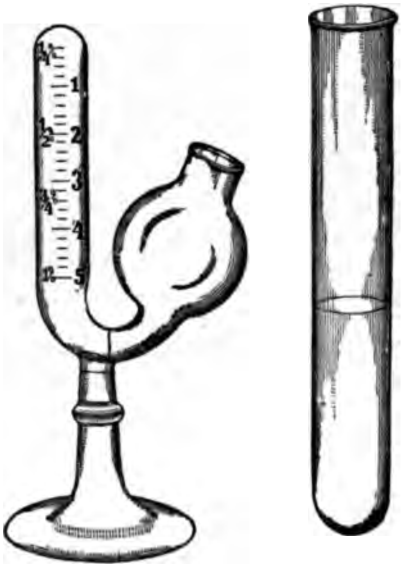

FIG. 1.—EINHORN SACCHAROMETER.

Quantitative Test : The quantitative test is important to ascertain whether the diet and treatment are diminishing the amount of sugar, even though the severity of the disease is not in proportion to the amount of sugar. *Procedure :* Remove albumin by precipitating, after acidifying, boiling, and filtering the precipitate. Dilute the urine from one half to one fifth. Fill the graduated burette with the diluted urine. Dilute 5 c.c. of Fehling's solution with 40 c.c. of water. Let it boil over a wire gauze frame. While boiling let diluted urine fall in, drop by drop. Remove the flask from the flame from time to time to allow the precipitate to settle, and to observe the color of the solution. When every particle of blue color has disappeared, read the amount of dilute urine used from burette. The amount of sugar can be estimated from this formula:

y : .05 : : 100 : x grms. of glucose.
y = number of c.c. of diluted urine used.
x = grms. of glucose per 100 c.c. of diluted urine employed.

Example: If 10 c.c. of urine diluted five times have been used, we have used 2 c.c. of urine. Hence, 2 : .05 :: 100 : answer = 2½.

Why? Fehling's solution is of such composition that 10 c.c. requires for complete reduction .05 grm. of glucose.

Acetone is found in the urine in severe forms of diabetes mellitus, after **ether anæsthesia,** and in those diseased conditions in which there is a hig degree of albumin destruction, as in high fever, severe anæmias, many carcinomas, acute active phthisis, and in disturbances of digestion.

Test: Pour a few drops of a strong solution of sodium nitroprusside into a small amount of urine in a test tube, and make it markedly alkaline. At first a purplish red color appears, gradually turning to yellow. Add two to three drops of acetic acid. The presence of acetone gives a color ranging from carmine to a purplish red.

Diacetic Acid and **β-Oxybutyric Acid** are found in the urine in severe cases of diabetes mellitus.

Test: Add strong ferric chloride solution to unboiled urine until all phosphates are precipitated, then add carefully a diluted ferric chloride solution. A Bordeaux red coloration of the urine indicates diacetic acid. This coloration will disappear on heating.

The presence of β-oxybutyric acid is detected by the polariscope after eliminating the sugar by fermentation. The ray of light is turned to the *left*.

Bile.—Bile in the urine indicates some obstruction to its normal flow. It may be detected in the urine before other symptoms of jaundice develop.

Test: If about half an inch of fuming nitric acid be poured into a test tube and a few drops of urine be allowed to float on the top, the presence of bile will give at line of contact a play of colors, red and green predominating. When the fuming nitric acid comes in contact with the urine and a brown or purplish ring forms without a play of color, it indicates the presence of indican.

Indican.—The presence of an abnormal amount of indican in the urine indicates a putrefaction of albumin somewhere in the body tissues or in the body-cavities, usually of bacterial origin. Indican is almost invariably formed in the intestinal tract (ileum) as the result of proteid putrefaction due to bacterial action, probably the colon bacillus.

Test: To 5 c.c. of concentrated hydrochloric acid and 5 c.c. of urine add four drops of a half per cent solution of potassium permanganate in water and 2 c.c. of chloroform. If the solution is blue after shaking, indican is present. The intensity of the color indicates the relative amount of indican in the wine.

Mucus.—The presence of mucus in the urine in abnormal amount indicates an inflammation along the urinary tract, generally a cystitis.

Test: Noticed as cloudiness throughout the urine, which has been allowed to settle slightly. Under microscope it is seen as numerous shreds, clumps, or masses, hyaline in character. If urine containing a fair amount of mucus be acidified and boiled, we get a cloudiness similar to that given by albumin.

Hæmoglobin.—The presence of small amounts of blood in the urine, or derivation from the red blood cells can be demonstrated by testing for hæmoglobin, or its derivatives, with the polariscope.

Color test: To a small amount of urine in a test tube, add one fourth its volume of caustic potash and boil. The earthy phosphates will be precipitated. The presence of blood gives the flocculent precipitate a reddish brown color. If the urine is much pigmented, as by bile in jaundice, the color will prevent the reaction. Also look for red blood cells with the microscope.

Urea.—The normal amount of urea excreted in twenty-four hours is from 20 to 40 grms. (450–600 grains). The diagnosis of a chronic interstitial nephritis without exudation is made by the specific gravity and by estimating the amount of urea secreted in twenty-four hours. A specimen of urine from each of the amounts of urine passed in twenty-four hours should always be employed for examination.

Test: Solution sodium hypobromite.

℞	Sod. hydrate (30-per-cent sol.), ...	70 parts;
	Bromine, ...	5 parts;
	Water, ...	150 parts.

As the solution keeps only a few days, it should be made fresh each time. The sodium hydrate solution and the bromine should be kept separate. Fill the apparatus so that when erect no air can enter the tube. The urine should be diluted once. This is not necessary unless the urine is very concentrated. Take 1 c.c. of urine in the pipette, immerse the tip under the bend in the apparatus with great care so as not to allow air to enter, and discharge all of the 1 c.c. into apparatus by slowly pressing the bulb of pipette. None of the air behind the column of urine should be pressed into the apparatus. Allow it to remain for one half hour. Then read amount of solution displaced. The number of milligrams of urea marked on tube are displaced by 1 c.c. of *diluted urine*. It is a simple calculation to find the total quantity of urea for twenty-four hours in a twenty-four-hours' undiluted urine.

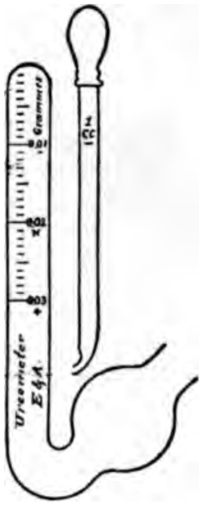

FIG. 2.—UREOMETER.

Chlorides.—An increase or decrease of chlorides in the urine is of importance. They are increased in polyuria and during absorption of inflammatory fluids. They are decreased in starvation or lack of food, in vomiting, where little absorption of food takes place, in diarrhœa, where there is a serous discharge, and in inflammatory exudative processes, particularly where there are purulent exudations. This is the most important cause for the decrease in the amount of chlorides. The test for chlorides is indirectly a test for purulent inflammations, such as pyæmia, and in pneumonia. The latter disease in some of its phases at times simulates typhoid or malaria. The very small amount of chlorides excreted in pneumonia may be of differential diagnostic value. Indeed, it is said that the prognosis in pneumonia may be determined by the amount of chlorides in urine, *as in fatal cases there is almost a complete absence of these constituents.* There is frequently a slight decrease several hours before the crisis in pneumonia, before there is any clinical change.

Test: Remove albumin by precipitating it by boiling the slightly acidulated urine and filtering. Take an inch of filtered urine in a narrow test tube, cool and acidify with one or two drops of concentrated nitric acid. Add one drop of a 5 per cent solution of silver nitrate. A white precipitate is formed of silver chloride.

Quantitative Test for Chlorides: Take 5 c.c. urine, diluted so as to subdue the color. Titrate with decinormal silver nitrate solution, using yellow potassium chromate as indicator. End reaction is reached when the orange red color first becomes permanent. The amount of chlorides may then be determined from amount of silver nitrate requisite.

Diazo Reaction.—This is supposed to be of value in the diagnosis of typhoid fever, but it may be absent in many cases. It is present in the worst (usually fatal) cases of tuberculosis.

Test: This test requires two solutions:

No. 1.	Sulphanilic acid,	1.0
	Concentrated hydrochloric acid,	50.0
	Water,	1,000.0
No. 2.	Sodium nitrite,	5.0
	Water enough to make,	1,000.0

Take 5 c.c. of urine in a narrow tube, add 5 c.c. of solution No. 1, then add three drops of solution No. 2. Float 2 c.c. of ammonia on top. At the point of contact a deep garnet ring will appear and a salmonpink foam on shaking.

Hæmatoporphyrin, a hæmatin derivative, is found in traces in all urines, as well as in fæces. Increased amounts in the urine seem to suggest hepatic insufficiency. In addition to its having been found in the urine of cases of various forms of hepatic disease, *hæmatoporphyrinuria* has been observed in cases of phthisis, exophthalmic goitre, typhoid fever. It is also often found in intestinal and gastric hæmorrhages, in lead poisoning and especially after long continued use of sulphonal, trional, and tetronal. Urines containing an excess of hæmatoporphyrin are usually dark red in color; but the shade may vary from a sherry or port wine tint to a dark Bordeaux.

Test (Simon): Thirty c.c. of urine are treated with an alkaline solution of barium chloride. The precipitate, after having been washed with water, and then with absolute alcohol, is extracted with ordinary alcohol, acidulated with hydrochloric acid, by rubbing in a mortar. The solution thus obtained will present a reddish color in the presence of hæmatoporphyrin, and its filtrate yields the characteristic spectrum of the latter substance, i. e., four bands of absorption, of which two are broad and dark and two light and narrow. The former alone are characteristic, and frequently the only ones visible. One of these extends beyond D into the red portion of the spectrum, while the other is situated between B and F of the other two bands. One may be seen between C and D, and the other between D and E, nearer E.

Microscopical Examination of Urine

Casts.—These are cylindrical, albuminous bodies derived from blood serum and take their shape from the uriniferous tubules below the loops of Henle. The different varieties receive their names from their consistency and contents.

Hyaline casts.—Homogeneous, transparent, cylindrical, broader than a leucocyte but often much narrower. Their length varies. The border is delicate, distinct, and not refracting. The ends are rounded. They are found in a large per cent of centrifuged urine, and of themselves are of no diagnostic value, but are always abnormal, i. e., they are not a normal constituent of urine. They are more common in the urine of old persons and in people suffering from chronic diseases; also after many conditions causing temporary ailments. They are abundant in chronic nephritis in children and adults.

Waxy casts usually indicate an amyloid change in the kidney. They are stained a mahogany color by iodine in acid solution. They are usually broader than hyaline casts, the edges are sharp, and they are less transparent, most frequently opaque. They are found in chronic nephritis, particularly amyloid and chronic parenchymatous changes. Their presence is against the diagnosis of acute nephritis.

Granular casts.—*a.* Finely granular—a hyaline body covered or mixed with *fine granules of urates.* They are of no more importance than hyaline casts, but excite suspicion. *b.* Coarsely granular—are found by the breaking down of the bodies of epithelial cells. There may be a little hyaline substance in the body, but the granules usually are so thick as to give the casts the appearance of being opaque and yellow. Shreds of epithelial cells may be seen. They are of considerable significance and indicate a chronic nephritis or an acute exacerbation of a chronic nephritis. It may be some weeks or months after an attack before they are found. In centrifuged urine, hyaline casts studded with urinary salts present the appearance of granular casts. This is not ordinarily the case in gravity sediment, i. e., sediment formed on standing.

Epithelial casts are formed of intact or broken-up epithelial cells. They are yellowish, large, broad, opaque, with regular edges, and may or may not have a hyaline matrix. All gradations between coarsely granular and epithelial casts occur. They signify an acute nephritis or an exacerbation of a chronic nephritis, and are frequently found in chronic nephritis.

Pus casts are made up of leucocytes, and are to be differentiated from epithelial casts by: (*a*) Their transparency, (*b*) their lighter color, (*c*) the absence of characteristic structure. Their presence indicates an acute infectious exudative nephritis. A purulent nephritis also has pus casts, but there are also many cells free in the urine.

Blood casts are casts packed with red blood cells. *Significance*: Acute nephritis or an acute exacerbation of a chronic nephritis or traumatism.

Bodies resembling Casts.—*Masses of Urates.*—The outline is ragged instead of defined; edges are dark instead of yellow or transparent.

Cylindroids from urine of cystitis are differentiated by non-uniformity in size and shape. They have the same significance as hyaline casts.

Blood in Urine.—If blood be not diagnosed grossly, it can be recognized with the microscope. In the urine, it may come from any portion of the genitourinary tract. (See Hæmaturia.)

Aloin Test for Blood.—One fifth volume of glacial acetic acid is added to suspected material and allowed to stand one half hour. Sulphuric ether, one third volume, is then added and allowed to stand one half hour. The ethereal extract is decanted into small test tube. A few grains of aloin are added. Peroxide of hydrogen or other oxidizing agent is then added, of volume equal to that of ethereal extract. A cherry red color indicates blood. This test can be used for urine, fæces and stomach contents.

Pus in Urine.—Pus is readily recognized in urine by means of the microscope. It also may come from any portion of the genitourinary tract. If associated with pus casts, it probably comes from the kidneys. Pus from kidney in pyelitis is said to occur in little masses composed of six to eight or more leucocytes closely packed together. (See Pyuria.)

Test for Pus: Add strong KOH to urine. Pour from one beaker to another several times. The formation of a tenaceous stringy mass is indicative of pus.

Epithelium.—This is readily seen and recognized under the microscope, but the differentiation in cells from different parts of the genitourinary tract is very difficult and requires much experience. The cells from the pelvis of kidney are columnar and sometimes round or polygonal, and similar cells are found in follicles of the prostate gland. Bladder cells are broader and shorter. Large, flat, squamous epithelial cells from the vagina are found normally in urine from the female.

Spermatozoa.—These are found often in urine of both the female and male after coitus, and after a seminal emission. If a urine constantly contains spermatozoa, this is an indication of spermatorrhœa.

Gonococci.—Gonorrhœal threads can be found in urine by having patient urinate in two glasses, and holding the first up to the light, when mucoid particles can be seen floating in the fluid. To find the gonococci, it is best to take a drop of pus or mucus from urethra and stain as described under Discharges. They can often be found only in the shreds.

Tubercle Bacilli.—The tubercle bacillus can often be found in urine which has been centrifuged and also frequently in gravity sediment. It closely resembles the smegma bacillus and the similarity in their staining properties demands decolorization in pure alcohol for about twelve hours. The smegma bacillus is decolorized by this treatment. If the urine is carefully drawn with a catheter, the smegma bacillus can often be excluded.

Typhoid Bacilli.—This bacillus is almost constantly found in the urine of typhoid-fever patients, and is demonstrated by making cultures. Other organisms found in the urine are the Micrococcus ureæ, the different pus cocci, actinomycosis granules, yeast cells and mold, colon bacillus, several forms of proteus, Staphylococcus aureus and sometimes the streptococcus.

Parasites in Urine.—A few parasites have been found. The trichomonas, amebæ, ova of the distoma hæmatobium, and the larvæ of *Filaria sanguinis hominis*.

Inorganic elements are always found in urine. If the urine is acid, we may find crystals of uric acid, urates, and calcium oxalate, or neutral calcium phosphate. If the urine is alkaline, we may find crystals of triple phosphate, calcium phosphate, carbonates and ammonium urates and calcium oxalate, and magnesium phosphate. Leucin and tyrosin are found in the urine in poisoning by phosphoric acid, in acute yellow atrophy of the liver, and in severe cases of typhus fever and smallpox.

Test: Evaporate the urine to consistency of syrup and examine under microscope for characteristic crystals.

EXAMINATION OF FÆCES

CHARACTERISTICS

Number of Stools.—The normal number is one stool a day. Three in one day or one in forty-eight hours may not be an indication of a pathological condition.

Reaction whether acid or alkaline is not significant.

Amount.—The amount varies in proportion to the solids ingested. The average is 60 to 250 grams in twenty-four hours, of which about 75 per cent is water.

Consistence.—The consistence varies from the watery discharges in cholera, to the hard, scybalous masses of chronic constipation, and depends largely upon the amount of fluids ingested and the condition of the digestive tract.

Odor.—The natural offensive odor of fæces is due to albuminous decomposition and the resulting principles: indol, skatol, phenol, ammonia, fatty acids, hydrogen sulphide, etc. Some odors are characteristic, such as those of fatty diarrhœa in children, some alcoholic stools, in chorea and in amebic dysentery.

Color.—The normal color varies according to the character of the food and the amount of pigment derived from bile. In infants, fat and undigested milk gives to the stools a whitish color tinged with bile pigments. In adults the color is usually brownish yellow.

Green stools are seen after taking calomel and on exposure to air. Such stools are usually acid.

Black or very dark stools may be due to a meat diet, huckleberries, red wines, iron, manganese, and bismuth. Many stools containing old blood are dark or black.

Yellow stools may be caused by the ingestion of santonin, rhubarb, and senna. *Typhoid stools are yellowish,* having received the name of "pea soup stools."

White or clay colored stools are due to alcoholic conditions in which there is an obstructive jaundice.

The *Gmelin reaction for bile* (the play of colors when the fluid being treated comes in contact with fuming nitric acid) is not found in normal stools. If found, it indicates disturbance in the small bowel (active intestinal catarrh in children). The presence of leucocytes, epithelial cells, mucus, and bacteria give the whitish, so-called "rice water" stools. Rupture of an abscess gives a whitish or yellowish stool (pus).

Much recognizable detritus may be observed in stools. This is composed principally of imperfectly masticated or accidentally swallowed vegetable products, such as orange cells and strings of spaghetti, which are sometimes mistaken for parasites. Glittering white deposits or streaks are composed of long crystals of fat derivatives.

Foreign bodies of nearly every description, and gall stones, are found by passing fluid fæces through a sieve. Greasy, translucent, jagged calculi are due to the crystallization of cholesterin; dark brown, heavy, and hard calculi may be formed in the intestines and passed in the fæces. Calculi containing calcium salts are opaque, usually light colored, brittle, and have rough granular surfaces.

Mucus in different forms, according to the portion of the intestines where it is secreted, is often found in the fæces. If abundantly formed in the small intestine and upper colon, it is well mixed with bile pigment, epithelial cells, leucocytes, and food detritus. In colitis, mucous masses are well separated from the other constituents. In inflammatory conditions of the rectum, discrete masses of mucus may be adherent to the surface of the stool.

Casts of part of the intestinal tract, or cylinders of thick, white mucus resembling fibrin are diagnostic of membranous enteritis. These mucous masses are from several inches to a foot in length and may be spirally twisted or ribbon shaped. They often resemble a tapeworm, for which they have sometimes been mistaken, and are of the consistence of jelly.

Pus often occurs in fæces from rupture of a tubal or supravaginal abscess or from appendicitis. In ulcerative colitis or carcinoma of the rectum much pus is seen in the dejecta.

Blood in the stool differs in appearance according to the location in the digestive tract from which it comes. When from the stomach, the action of the gastric digestion causes it to appear in the form of fine granules, giving a grayish black color to the stool. Rarely, gastric blood gives a tarry stool. *Tarry stools* with some lumps of blood undissolved, may occur in duodenal ulcer. Ulcers of the ileum are usually attended by stools of pure blood, or by blood well mixed with the fæces, retaining more or less its red color. From an ulcerative colitis, red blood cells are nearly always found in shreds of mucus which are blood stained. In hæmorrhages from the colon, if large, and from the rectum the blood is very little changed.

MICROSCOPICAL EXAMINATION OF FÆCES

Muscle Fibres.—These are found with striations preserved or reduced to colorless, homogeneous, translucent, oval or elliptical bodies. Starch grains usually appear as coarse, refractive bodies which turn blue or brown when treated with diluted nitric acid and Gram's solution.

Fat may be seen as fat globules, in crystalline forms, or in cholesterin plates. Normal stools nearly always contain some fat, but strictly speaking, this is not a fat, but when present in large quantities it often indicates a diminished production of pancreatic juice and bile, and is characteristic of some acute and chronic diseases of the small intestine.

Coagulated proteids, *vegetable cells*, and *diatoms* are often noticeable in the stools. *Pus cells* more often indicate an ulcerative process than a simple catarrh. *Blood cells* can frequently be found when a gross inspection of the stool fails to reveal the presence of blood. *Epithelial cells* in the stools may often be of great importance. A few may be found in normal stools, but in catarrhal conditions they are very abundant. In *cholera* the stools are largely composed of serum, epithelium, leucocytes, and bacteria.

In *typhoid ulcers*, epithelial cells and shreds of necrosing tissues may be found. A diagnosis between catarrhal and ulcerative processes may be made by finding clumps of epithelial cells, adherent leucocytes, and blood cells in

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[1] The solid contents of fæces can be collected by means of a flour sifter rotating in water.

the masses of mucus discharged from ulcers. *Shreds of malignant new growths*, with their atypical cells, can help in diagnosis.

Crystals of the fatty acids are very frequent, and *cholesterin* occasionally. They seem to be of no significance. *Charcot-Leyden crystals* are sometimes found in abundance and are said to be present in the fæces in people who are known to have intestinal parasites.

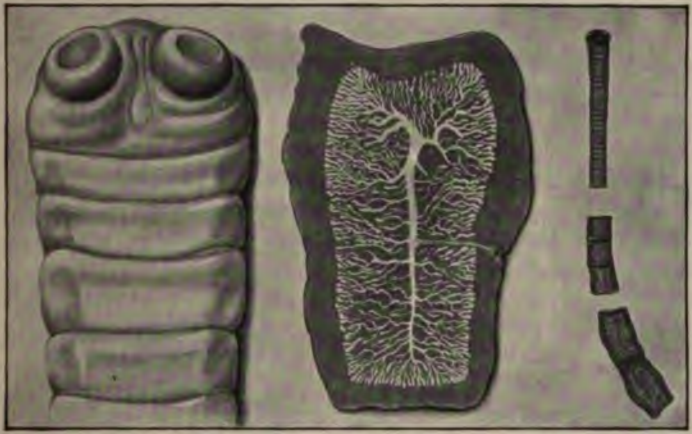

FIG. 3.—SCOLEX AND SEGMENTS OF TÆNIA SAGINATA.

Calcium oxalate, sulphate, and *phosphate* are found, especially after a vegetable diet. *Triple phosphates* also are found very often, and are associated with *alkaline diarrhœal stools*. *Bismuth* gives typical *black crystals*, and altered blood gives *hæmatoidin* crystals of a brownish-red color.

Bacteria and Protozoa in Fæces.—There are many microorganisms in the intestinal tract, some of which ordinarily are harmless, but under certain conditions become pathogenic. Some are distinctly harmful and seem to cause the diseased conditions.

The Bacillus coli communis is constantly present in the fæces from all parts of the intestine in health as well as in disease. It has been found exclusively in cases of appendicitis, peritonitis, empyema of the gall bladder, nephritis, pyelitis, cystitis, and occasionally in pyosalpinx.

The Bacillus lactis aerogenes and the *Proteus vulgaris* (also found normally) are present in many cases of cholera infantum. The distinctly pathological bacteria of fæces are the *Bacillus typhosus* in typhoid fever, which can be isolated by plate-culture during the first few days of the fever; the *Comma bacillus* present in Asiatic cholera; the *Streptococcus pyogenes* which is probably the etiological factor in some forms of enterocolitis; the *Bacillus dysentericus* (*Shiga bacillus*), and the *tubercle*

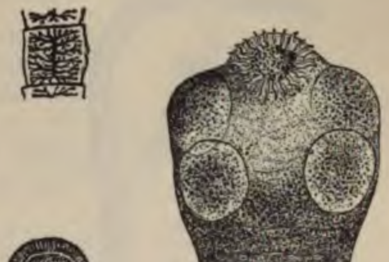

FIG. 4.—TÆNIA SOLIUM.

bacillus. The *Ameba dysenteriæ* is very probably the specific germ of one form of colitis, particularly that type associated with hepatic abscess. They so much resemble an epithelial cell that an absolute diagnosis can be made only by seeing them moving under the microscope. In order to keep them alive long enough for examination, the defæcation must be received in a warm pan, and the slide must be warmed. The question as to the pathognomonic relation of ameba to diarrhœa is by some still considered an open one.

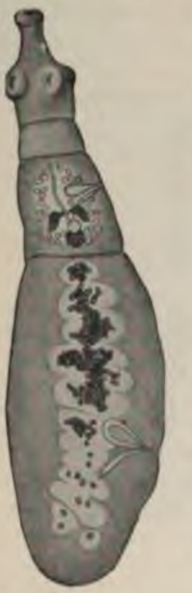

FIG. 5.—TÆNIA ECHINOCOCCUS. Magnified 20 diameters. (Braun.)

WORMS

Tænia solium, or pork tapeworm, is not uncommon. The head is provided with hooklets. *Tænia saginata*, or beef tapeworm, is the one usually seen. *Bothriocephalus latus*, or the fish tapeworm, is rare in this country. The head is not provided with hooklets. *Tænia echinococcus*, although living in the intestinal tract of the dog, may enter man by means of its eggs, and produce cysts, particularly in the liver. The head is covered with little hooklets which, if separately found, are diagnostic of its presence.

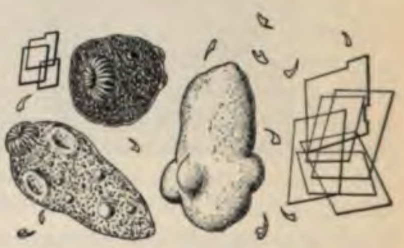

FIG. 6.—CONTENTS OF AN ECHINOCOCCUS CYST SHOWING SCOLICES, HOOKLETS, AND CHOLESTERIN CRYSTALS.

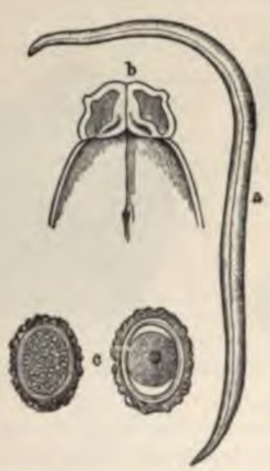

FIG. 7.—ASCARIS LUMBRICOIDES (Roundworm).

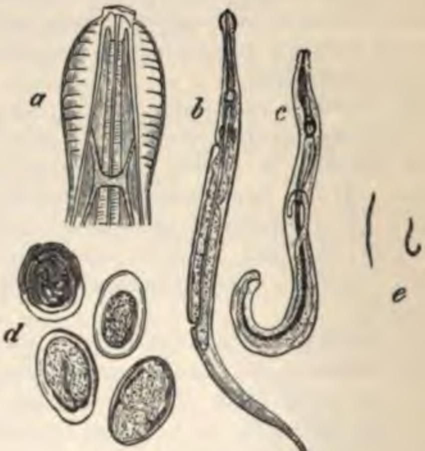

FIG. 8.—OXYURIS (Pinworms).

The Nematodes.—*Ascaris lumbricoides*, or roundworm, is common in children. It measures from six to sixteen inches in length and may wander all along the intestinal tract and produce indefinite nervous symptoms. *Oxyuris vermicularis*, thread or pinworms, are found in the lower ileum, colon, and rectum. They may cause intense pruritus. *Anchylostomum duodenale* and the *Trichocephalus dispar s. hominis* are also found, and are supposed to produce profound anæmia.

Although the chemical examination of the fæces is important, our present knowledge is not sufficient for it to be of much clinical significance.

CLINICAL EXAMINATION OF THE STOMACH CONTENTS

APPARATUS

Stomach tube.
Three beakers.
Long c.c. pipette.
Porcelain evaporating dish.
Litmus paper.

Titrating apparatus: a graduated pipette on a stand with a stopcock at the base permitting the flow of the decinormal solution drop by drop.

CHEMICALS

Solution phloroglucin vanillin. (Günzberg's Test.)

℞ Phloroglucin,	2 parts;
Vanillin,	1 " ;
Absolute alcohol,	30 " .

FLUIDS REQUIRED FOR GETTING THE TOTAL HYDROCHLORIC ACID IN STOMACH CONTENTS

1. Amidobenzol, 5 per cent alcoholic solution.
2. Alizarin, 1 per cent aqueous solution.
3. Phenolphthalein, 1 per cent alcoholic solution.
4. Three beakers, each containing 5 c.c. of filtered stomach-contents and each diluted with an equal quantity of distilled water.
5. Decinormal solution of sodium hydrate.

Method of preparing a decinormal NaOH solution: Dissolve 63 grms. of oxalic acid C. P. (accurately weighed) in distilled water, bringing the solution up to one liter at a temperature of 60° F. (15° C.). Dissolve about 40 grms. NaOH (C. P.) in distilled water and bring the solution up to one liter.

Place 10 c.c. oxalic-acid solution in a beaker, add one drop of phenolphthalein, and titrate from a burette with the soda solution.

If it takes 9.5 c.c. of the soda solution to neutralize 10 c.c. of oxalic acid, 5 c.c. of water must be added to each 9.5 c.c. of the soda solution to render it of the standard normal strength, and to 950 c.c. of soda solution 50 c.c. of water must be added. Water may readily be added in whatever proportion is found necessary. Nine parts of water added then to one part of the normal gives the decinormal solution. (Ewing.)

Gross Appearance.—Food products in early stages of digestion, such as milk curds, particles of meat, vegetable detritus, are readily recognized by the naked eye.

Mucus appears in nearly all vomitus as thin, translucent, stringy masses. In chronic gastritis more opaque mucus and more uniformly mixed with food is found. Blood is sometimes streaked, clear, and unchanged through vomitus in acute gastritis. Fresh blood is seldom seen in vomitus, as its presence in the stomach for only a few minutes changes it to a dark brown color. This is not true of the larger hæmorrhages, as from the rupture of a blood vessel. The usual vomitus from an ulcerating carcinoma resembles coffee grounds in form and color.

Where pyloric obstruction and dilatation of the stomach exist, large quantities of a blackish fluid may be vomited, the color of which is due to old and greatly altered blood. *Bile* frequently discolors the vomitus, especially after long straining at emesis, giving a color from yellowish to greenish. *Pus*, from rupture of a neighboring abscess, may appear in large quantities. *Fæcal matter* appears when there is intestinal obstruction. *Roundworms* are rather frequently seen in vomitus, and Oxyuris vermicularis and Anchylostoma duodenale very rarely.

MICROSCOPICAL EXAMINATION

The following may be looked for:

Muscle fibres with striations as oval, elliptical, yellowish or colorless, slightly refractive bodies; a great variety of vegetable cells and starch grains, with concentric layers and reacting to iodine; fat in globules or as crystals; blood in cells, as hæmatoidin, or as masses of pigment; *leucocytes*, recognized by their opaque granules and small refractive polymorphous or multiple nuclei; *epithelium*, columnar from stomach and squamous from œsophagus and mouth, found in the masses of mucus. In acute gastritis, epithelium may be very abundant. Particles of mucous membrane in chronic gastritis and shreds of tissue from ulcerating carcinoma may often be found after careful search. Yeast occurs in groups of three or more round or elliptical refractive bodies about the size of red blood cells. They frequently show several small buds. Sarcinæ are cocci growing in cuboidal packets of eight individuals or multiples of eight. *Bacillus acid lactici*, connected with fermentation, and the *Streptococcus pyogenes*, associated with some infectious cases of acute gastritis, have been isolated. The Oppler-Boas bacillus is found in stagnating stomach contents free from hydrochloric acid and not rich in lactic acid. By some authorities it is considered of diagnostic value in carcinoma of the stomach.

CHEMICAL ANALYSIS

Ewald's test breakfast is generally used. It consists of 30 to 70 grammes (2½ oz.) of white bread and 10 oz. of water. The test meal is to be given in the morning on an empty stomach. If there be retention of food, the stomach is to be washed out the evening before. One hour after eating the test meal, the contents of the stomach should be expressed or siphoned off. To the filtered contents the following tests should be applied:

Acidity, by litmus or Congo red paper. Free hydrochloric acid by Ginzberg's reagent. The reagent is thinly spread and evaporated over a clean porcelain dish. A few drops of the stomach contents are added and the dish gently heated over the flame. If there is free hydrochloric acid, a carmine-red color appears along the edge of contact of the stomach fluid.

Combined HCl and total amount HCl. The method of obtaining total productions of hydrochloric acid is based upon the sensitiveness of certain coloring reagents to the various acid principles found in stomach contents.

(*a*) Dimethylamidoazobenzol (or Toepfer's reagent) reacts only to free inorganic acids, such as free hydrochloric acid.

(*b*) Alizarin reacts to:
    Organic acids (lactic, butyric, etc.).
    Acid salts.
    Free, but not loosely combined HCl.

(*c*) Phenolphthalein reacts to:
    Organic acids.
    Acid salts.
    Free HCl.
    Combined HCl.

It has been found that 1 c.c. of decinormal soda solution neutralizes .00365 gramme of HCl. If 5 c.c. of decinormal soda solution are required to produce the final reaction with amidobenzol, the fluid contains 5 times .00365 grammes of free hydrochloric acid.

The combined hydrochloric acid may be found by subtracting the quantity required in the second titration (with alizarin) from that required in the third (with phenolphthalein); for, by consulting the foregoing lists, it will be seen that:

$6—b=$ the combined hydrochloric acid.

Hence, as a working formula, we may take the following:

Titration to get $a=$ free HCl.
" " $c=$ total acidity.
" " $b=$ inorganic acidity (all acidity except combined HCl).

Total acidity c, minus inorganic acidity $b=$ combined HCl, which, united to a (the free HCl) gives the total production of hydrochloric acid.

Method of Procedure: To one beaker, containing 5 c.c. of filtered stomach contents, diluted once, add one to two drops of amidoazobenzol solution, which, in the presence of HCl, immediately turns a bright red color. From the graduated burette decinormal soda solution is carefully added until, upon agitating the beaker, the fluid begins to turn to an orange yellow color. Soda solution is further added, drop by drop, until all traces of red have disappeared and the fluid is a bright lemon color, which indicates the final reaction. The quantity of soda solution used is noted, from which is computed the amount of free hydrochloric acid present.

To the second beaker, one to two drops of alizarin solution are added, and the titration conducted as above. The final reaction is indicated when a deep violet color is reached. From the amount of soda solution used may be computed the acidity due to all acid principles except loosely combined HCl.

To the third beaker, one to two drops of phenolphthalein solution are added and it is titrated as before. The final reaction is indicated when the rose color first appearing no longer darkens on further addition of soda solution. From the amount of soda solution used the total acidity is computed.

Significance of Changes in the Amount of HCl in Stomach.—If the normal amount is found (.1 per cent to .2 per cent), it is strong evidence against any organic disease of the stomach. The symptoms referred to the stomach when a normal amount of HCl is present must be due either to a nervous or atonic condition. *Continuous hyperacidity* (over .2 per cent) occurs most frequently in neurotic dyspepsia, is very often present in simple ulcer, and may often be a symptom of the early stages of a chronic gastritis. It speaks strongly against carcinoma except when a simple ulcer is undergoing carcinomatous transformation. *Continuous subacidity* (under .1 per cent) is seen in chronic gastritis, especially with dilatation and atony, in some cases of simple ulcer with chronic gastritis, and in incipient carcinoma. *Anacidity* is a frequent and persistent symptom of the later stages of chronic gastritis, when pepsin is also lacking. When pepsin is present, it may indicate a neurosis. When other signs are favorable, it speaks strongly for carcinoma. If the amount of acidity due to HCl varies markedly, in all probability it indicates a neurosis.

Lactic Acid.—The test for lactic acid usually employed is Uffelmann's. Although there are sources of error, this test is fairly reliable. *Test*: Take 10 c.c. of a 5 per cent solution of carbolic acid; add 20 c.c. of distilled water, and one drop of a 5 per cent solution of ferric chloride. An amethyst blue color appears, which may soon change, making it imperative to use the solution when fresh. A few drops of the stomach contents added to this solution produces a lemon color if lactic acid be present.

Significance of Lactic Acid.—It is often ingested with food, and forms early in digestion when milk or bread have been taken. It is seldom present after eating carbohydrates. It is found in traces only during the course of non-malignant disease of stomach. It is usually present in larger proportion in dilatation with stagnation of the gastric contents. If it is associated with retention and absence of HCl it is strongly suggestive of carcinoma.

Pepsin.—Marked diminution or absence indicates a corresponding disturbance of the glandular activity. It may exist, however, with a variety of lesions.

Absorption and Motility.—The absorption activity of the stomach may be roughly indicated by Penzoldt's test: When 5 grammes of potassium iodide are taken in a gelatine capsule, iodine appears in the urine and saliva of the normal subject within six to fifteen minutes, while with deficient absorptive capacity its appearance is much later. The iodine may be detected by applying a few drops of saliva or urine with one drop of strong nitric acid to starch paper, which, in the presence of iodine, turns blue or violet.

Sahli's test of gastric efficiency consists in the use of a pill containing a small amount of either iodoform or methylene blue, which is enveloped in a small bit of the rubber dam used by dentists, the neck of the little bag formed being tied off with the finest obtainable raw catgut. Such a pill is given at the end of the ordinary noon meal and the urine passed at stated intervals during the afternoon and evening is either examined in regard to the first appearance of a greenish color if methylene blue was used, or is tested for the presence of iodoform in case this indicator was chosen. The latter substance has the practical advantage that it may be detected with equal certainty in the saliva. The appearance of either substance in the urine, or of iodoform in the saliva, indicates satisfactory gastric digestion and a negative result the reverse, the information obtained being, according to the author, a sufficient index as to the combined activity of the hydrochloric acid and the pepsin.

The motility of the stomach is best determined by giving a test meal at night on an empty stomach, and examining the washings the next morning. Normally no traces of ingested food should remain.

A chemical examination of the gastric contents simply shows us the chemical composition of the gastric secretion at the time the analysis was made, and is simply one factor in the diagnosis, prognosis, and therapeutics of digestive disturbances of whatever nature.

SPUTUM

GROSS CHARACTERISTICS

Types of Sputum.—The following special types should be noted:

Mucoid.—A good example of this is seen in chronic bronchitis. It is light in color, slightly translucent, viscid, tenacious, elastic, and very slightly aerated.

Mucopurulent.—Seen in acute bronchitis. The admixture of pus with mucoid sputum renders it yellow, opaque, less tenacious and elastic. It is more completely aerated.

Purulent.—In severe bronchitis, tuberculosis, and with rupture of lung abscess it may be pure pus. Purulent sputum has more pus than mucus and no viscid quality.

Blood-Stained.—This is seen in acute bronchitis, pneumonia, tuberculosis, tumors of the lung and hæmophilia. The blood exceeds the mucus. The viscidity is reduced, although the sputa remains coherent.

Pure blood is expectorated in penumonia, phthisis, ruptured arteries, aneurysms, asphyxia, various septic conditions of infants, hæmophilia, trauma, and some blood diseases.

Rusty sputum is peculiar to lobar penumonia. It consists of gelatinous pellets of mucus slightly mixed with pus and uniformly tinged a rusty color. This type has been noticed after an attack of acute pulmonary œdema.

Serous.—This is semifluid. Upon standing, it separates into two layers. Such mixtures are common in the terminal stages of bronchitis, in Bright's disease, tuberculosis, pneumonia, and endocarditis.

Pure serum may be expectorated in acute œdema of the lungs, occurring in the initial stages of pneumonia or in nephritis with arterio-sclerosis.

Fibrinous coagula are often mixed with the sputa in chronic bronchitis and pneumonia. *Fibrinous casts* of the bronchi may be expectorated in **a** type of chronic bronchitis.

Gangrenous sputum is characteristic of putrefaction and necrosis of lung tissue. *Prune-juice expectoration,* indicating a decomposition of blood, is common in pneumonia. *Gangrene of the lung* gives a most fetid discharge, which, upon standing, usually separates into three layers: the uppermost being frothy mucus and pus; the middle, serum; while the heavier, at the bottom, is solid portions of tissue.

Nummular sputum is the name given to purulent, coin-shaped sputa coming from old cavities with suppurating walls. *Bile pigment* may stain sputa in some of the severe forms of infectious disease and jaundice. *Actinomyceces* in colonies appear as small, white, partly calcified granules and resisting considerable pressure. *Curschmann's spirals* can usually be detected by the naked eye, as whitish, opaque, spiral, threads, 1 to 10 mm. in length. Masses of *lung tissue* are small, grayish in color, and irregular in outline. *Hæmatoidin* is seen as dark brown particles resisting much pressure.

MICROSCOPICAL EXAMINATIONS

Mucus and *fibrin* appear in smear preparations as fine or coarse reticulated threads. *Red blood-cells* have their ordinary appearance. *Epithelial cells* from the mouth are squamous; from the bronchi or nares columnar with or without cilia; from the lung parenchyma they are rounded, large, and usually contain black pigment. In pulmonary congestion from endocarditis, the epithelium contains large brownish grains of blood pigment. *Leucocytes* are recognized by their multiple nuclei and clear bodies.

Elastic fibres, occurring singly or in masses showing a distinct alveolar arrangement, are recognized as large, wavy, highly refractive threads lacking the double contour of vegetable fibre. They can be said to indicate destruction of living tissue only when they appear in characteristic alveolar arrangement, and are most frequent in tuberculosis. They have also been found in bronchiectases, abscesses, and rarely in pneumonia. *Charcot-Leyden crystals,* elongated and diamond shaped, are found in chronic bronchitis. Hæmatoidin, fatty acid, cholesterin, calcium carbonate, and triple phosphate crystals are also occasionally found. Curschmann's spirals, found in chronic bronchitis and asthma, frequently contain a number of Charcot-Leyden crystals within the meshes.

Microorganisms.—*Molds, aspergillus, leptothrix,* and *yeast fungi* are sometimes seen in sputum from phthisis cavities and abscess of the lung. The *ray fungus* is observed in pulmonary actinomycosis. It appears as branching, interwoven threads, having swollen or club shaped ends, and can be easily demonstrated. *Streptococci* are frequently found in the mouth, and may have no pathological significance. In severe acute bronchitis they have been found in large numbers. With *staphylococci,* they are abundant in sputum from cavities.

Pneumococci (Diplococcus lanceolatus) may often be found in the mouths of healthy individuals, but are especially abundant in the expectoration of pneumonia. The *pneumobacillus* of Friedlander is found in a few cases of pneumonia. It is encapsulated and resembles somewhat the pneumococcus except that it is rod shaped, broader, longer, and has rounded ends. Both may be stained by Welch's method as follows, but the latter decolorizes by

Gram's method. *Welch's Method.*—The sputum is smeared, dried, and fixed on a glass slide by passing through a flame until the slide is as hot as the hand can bear. Then flood with glacial acetic acid, which is immediately drained off. Flood two or three times with aniline water gentian violet solution. Wash in a 2 per cent aqueous solution of sodium chloride, in which it may be mounted. It must not be washed with water. To prepare aniline water gentian violet, which must be used only when fresh, shake nine parts of distilled water with one of aniline oil, and filter through filter paper. To the filtrate add one tenth as much of saturated alcoholic solution of gentian violet.

Bacillus of influenza is a minute straight rod, with rounded ends, often staining more deeply at the ends. This often gives it the appearance of diplococcus. It is found in immense numbers, singly or in clumps of one hundred or more and often within the bodies of leucocytes. They are best demonstrated by staining five minutes with a weak solution of carbol fuchsin.

Tubercle bacillus can be found in the vast majority of cases of pulmonary tuberculosis. This bacillus grows in slender, straight, or slightly curved rods. The younger germs stain uniformly with carbol fuchsin, while the older present unstained points resembling vacuoles or spores, and sometimes present the appearance of a chain of cocci. They may occur singly, or two or more may lie side by side or end to end. *Method of staining.*—Fix the thinly spread sputum upon a glass slide by means of heat. Flood with carbol fuchsin for two minutes, gently heating. Wash thoroughly in water, and decolorize by flooding the specimen with acid alcohol solution for one minute. Wash in water, and counter-stain with aqueous methylene blue solution for about one minute. Wash in water, dry in air, and mount in balsam. The bacillus appears bright red, and the other parts of specimen are blue.

Micrococcus tetragenes occurs in groups of four and are very frequently found in tuberculosis, associated with the tubercle bacilli. When found with the latter they are said by Hoch to be an indication of cavity formation. They stain readily with all of the aniline dyes, particularly methylene blue.

The *smegma bacillus* stains with almost as great a tenacity as the tubercle bacillus, and to distinguish it from the tubercle bacillus the specimen must be decolorized in alcohol for about eight to twelve hours, after which time the smegma bacillus is decolorized.

TRANSUDATES, PUNCTURE FLUIDS, CYST CONTENTS

Aids to Differentiation.—Collections of serous fluid in body cavities or tissue spaces as the result of mechanical disturbance of the circulation, changes in the blood or in the walls of the vessels, unaccompanied by inflammatory phenomena, are true transudates.

The careful chemical and microscopical examination of the fluid is an aid to differentiation between an *exudate* and a *transudate*. The specific gravity in transudates is usually lower than 1.015, while in exudates it is higher than 1.018. The albumin content in transudates is less than in exudates. In the former it averages between 1 per cent and 2.5 per cent and in the latter 4 per cent to 6 per cent. As exudates are inflammatory in origin, we expect to find the products of inflammation, pus, epithelial cells, microorganisms, etc., while in transudates these elements are not usually present and occur only after long standing and introduction of infectious elements from without. Cyst contents may show the echinococcus hooklets, which are diagnostic.

EXUDATES

Exudates are inflammatory in origin, and their examination can aid as to the cause of inflammation. They may be serous, bloody (hæmorrhagic), fibrinous (serofibrinous), purulent (seropurulent), or chylous. Chyloid exudates differ from the chylous in that they contain much less free fat. The turbidity is due rather to cellular débris and lecithin. They may coagulate in the cavity or after aspiration. Microscopical examination is most important for the detection of isolated cells, or larger particles of a tumor, or of tubercle bacilli, gonococci, or other pyogenic microorganisms.

Tuberculous exudates are usually serous or hæmorrhagic, the latter form indicating more severe inflammation. A hæmorrhagic pleuritic exudate is usually tuberculous, and pleuritic exudates are more usually bloody than those of the peritonæum. Bacilli are present in tuberculous exudates in very small numbers, but in the necrotic foci they are more abundant. Rarely they may be found by staining the sediment. The best test, however, is inoculation into the peritoneal cavity of a guinea-pig.

Carcinoma or endothelioma of serous membranes is frequently accompanied by an exudate, which is usually serous, but often bloody. Isolated cells, or small masses of tumor, may be found in the sediment; but the cells must show the mitotic changes under the microscope to give a positive diagnosis. The diagnosis can frequently be made upon this basis of the presence of atypical epithelial cells alone.

Joint fluids usually contain mucus and are viscid. The exudate of traumatic or rheumatic synovitis is usually clear and sterile; while in tuberculous synovitis the fluid may be bloody or seropurulent, and tubercle bacilli may be demonstrated. In gonorrhœal synovitis fluid is serous or seropurulent and the gonococcus may often be demonstrated.

Discharges.—The *gonococcus* occurs principally in genitourinary discharges, but may be found in gonorrhœal infections of the rectum, mouth, eyes, serous cavities, and also in the blood. The usual location, however, is in the genitourinary tract, where it grows on surfaces lined by columnar epithelium. In the male, the gonorrhœal germ is found in acute and chronic urethral discharges. In gonorrhœal cystitis it is found in the threads, so-called "gonorrhœal shreds." In the female it is most abundant in and often limited to the urethral pus. Next in frequency it is found in the discharges from the cervix uteri. In the vaginal discharge other diplococci are often present, which makes differential diagnosis difficult. Hence it is always better to take the pus from the urethra or cervix. In female children the gonococcus is often found in the vaginal discharge, but seldom in the urethra. Children do not usually have gonorrhœal cystitis.

In looking for the gonococcus, we must note the following characters: It must be a biscuit shaped diplococcus. It must be found within bodies of pus cells. It must be decolorized by Gram's method.

Gram's method of staining gonococci:

The pus is smeared and fixed on a glass slide. Flood the specimen for 60 seconds with aniline water gentian violet, and blot off. Flood with Gram's iodine solution for one minute, and blot off. Decolorize in alcohol, 97 per cent, for two to four minutes. Counter-stain in saturated aqueous solution of Bismarck brown for one to three minutes. The biscuit shaped gonococcus is then seen stained brown within the cell bodies of the leucocytes.

The *anthrax bacillus* is present in large numbers in the exudate of malignant pustules. An aqueous solution of methylene blue (Loeffler's solution) stains it very well.

Pharyngeal exudate is frequently examined for evidence of diphtheria and other diseases of this region. A complete investigation of this exudate demands three procedures: 1. Morphological examination of the exudate. 2. Biological examination. 3. Test by inoculation.

1. Morphologically the Klebs-Loeffler bacillus, or the *Bacillus diphtheriæ*, is usually distinct. When only a very few bacilli are found and many cocci, we must resort to the biological test.

2. A smear from the throat is gently rubbed over the surface of a blood serum culture medium, and the latter kept in a thermostat for from twelve to twenty-four hours. Under these conditions the Klebs-Loeffler bacillus grows rapidly, outstripping other microorganisms found in the mouth and throat. After twenty-four hours the colony has a sharply outlined, slightly elevated, granular, dry, creamy yellow or grayish growth. Some of this growth is then to be transferred to a slide by the aid of a sterilized platinum wire, mixed thoroughly with a little water, spread into a thin film, and then dried, fixed, and stained. The preparation should be examined under the microscope with a $\frac{1}{12}$ oil immersion lens. *The methylene blue solution:* Saturated alcoholic solution of methylene blue, 30 parts; Aqueous solution of potassium hydrate (1 in 10,000), 100 parts. Stain for about one minute.

N. B.—Before a morphological diagnosis can positively be made of B. Diphtheriæ, it is essential that certain conditions be fulfilled, viz.:

1. Smear is from naso-pharyngeal or laryngeal exudate.
2. Culture must be growth not older than 16 hours at 37° C.
3. Growth has been made in Loeffler's blood serum.
4. Morphological characteristics must be typical.

3. In a case of mild pharyngitis, even with the above described tests, we cannot always diagnosticate diphtheria without inoculation. *Method of inoculation:* One half a cubic centimetre of a forty-eight hours' broth culture of the bacillus to be tested is injected subcutaneously into a guinea pig. Cultures of ordinary virulence will cause the death of the animal in thirty-six hours. If of slight virulence, the culture may require from three to four days to cause death, or it may fail to kill. Non-virulent cultures produce no distinct effect upon the animal.

STAINS

Carbol Fuchsin Solution:

Fuchsin (basic, not acid),	1.8 parts;
Carbolic acid,	5.0 parts;
Alcohol,	10.0 parts;
Distilled water,	100.0 parts.

Acid Alcohol Solution:

Absolute alcohol,	290.0 parts;
Concentrated hydrochloric acid,	10.0 parts.

Methylene Blue Solution:

Methylene blue,	1.0 parts;
Sodium chloride,	0.6 parts;
Distilled water,	100.0 parts.

BREAST MILK[1]

In mother's milk we may wish to estimate the amount of fat and proteids and to determine the specific gravity. By means of any small hydrometer, graduated from 1.010 to 1.040, we may determine the specific gravity of milk that has been expressed by hand or by means of the breast pump. The average is 1.031.

To approximately determine the percentage of fat, a small calibre test tube, graduated from 1 to 100, is filled to the 100 mark with milk pumped from the breast. An indefinite amount of ether is added, and the contents are thoroughly shaken. On standing for half a day the liquid separates into two layers, ether and fat, and milk minus fat. If, for example, the point of demarcation between the two layers is at 97, there is 3 per cent of fat.

To estimate the proteids, decant the ether and fat from the tube and precipitate the casein contained in the skim milk by the addition of acetic acid or rennet. The curd formed is then collected on a filter (the weight of the filter being known), and the salts, etc., are washed out with water. The filter and curd are dried in an oven and weighed together. Deduct the weight of the filter from the total weight, and the remainder will give the weight of the curd. For example, if in a test tube graduated in grammes the weight of the curd is found to be 2.0 grammes, the percentage of proteid is 2 approximately, if the quantity examined has been 100 grammes.

CULTURES

From time to time it is of advantage to be better acquainted with the microorganism than is possible from microscopical examination of pus or fluids as they are taken from different parts of the body. The study of bacteriology has demonstrated that a given microorganism seems to thrive better in one medium than in another. This knowledge enables us to obtain an early and abundant growth.

The bacteria which it is most often desirable to study by growth in culture media are: The Klebs-Loeffler bacillus of diphtheria, the colon bacillus, the streptococcus, the staphylococcus, the *Bacillus pyocyaneus*, the pneumococcus, the gonococcus.

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[1] Holt has devised an inexpensive milk tester.

Klebs-Loeffler Bacillus.—The Klebs-Loeffler bacillus grows best and most rapidly on blood serum. Its colonies are large, round, elongated, grayish, white, or yellowish, with the centre more opaque than the slightly irregular periphery. The surface of the colony is at first moist, but after a day or two becomes rather dry in appearance.

Rapid Bacteriological Diagnosis of Diphtheria.—Loeffler sugar blood serum. A sterile cotton swab is drawn over the exudate in the pharynx or on the tonsil, and smeared over the surface of a blood serum culture medium. After the test tube is inoculated, it is placed in an incubator, which has previously been heated to between 37° and 38° C. (98.6° and 99° F.). A small water oven, such as is in use in laboratories, just large enough for the test tube, is very good. It can first be heated to 37° or 38° C. with a Bunsen burner and kept at that temperature by means of an ordinary small kerosene lamp. The tube is left in the oven for two and a half to three hours, and then the growth is removed by means of a platinum wire loop. The smear is made as in staining for examination under the microscope.

Colon Bacillus.—The colon bacillus seems to grow most characteristically upon gelatin, and grows both with and without oxygen, on the surface and within the gelatin. On the surface the colonies appear as small, dry, irregular, flat, blue-white points that are commonly somewhat serrated at the margin. They are a trifle more dense at the centre than at the periphery, and are often marked at or near the middle by an oval or round nucleuslike mass. Examined by a low power lens, they are at first seen in the depths of the gelatin as finely granular, very pale greenish yellow, round, oval, and lozengelike colonies. Later they appear denser, darker, and more markedly granular.

Streptococcus.—The streptococcus appears on gelatin plates in from forty-eight to seventy-two hours as very small, flat, round, bluish-white and opalescent points. In gelatin stab cultures it grows along the entire needle track as a finely granular line, the granules representing minute colonies of the organism.

Staphylococcus.—The staphylococcus aureus, grown on agar-agar, usually appears to the naked eye as round, moist, glistening, yellow or orange colored colonies. When situated in the depths of the medium, they are commonly seen to be lozenge-shaped or whetstone-shaped, often as irregular stars with blue points, and again as dense, irregularly lobulated masses. After thirty-six to forty-eight hours, a pure stab culture in gelatin produces liquefaction along the line of the needle track. As the culture becomes older, liquefaction increases until all the gelatin in the tube becomes liquid.

Bacillus pyocyaneus, the bacillus of green pus, blue pus, or blue-green pus, as it is commonly called, when grown on gelatin plates, develops a round, not sharply defined mass, which at first usually presents a peripheral fringe of delicate filaments. As growth progresses, liquefaction occurs, and as the latter advances, the central mass of the colony sinks into the liquefied depression, while laterally the colony extends.

A stab culture in gelatin is accompanied with liquefaction, and diffusion of a bright green color takes place throughout the unliquefied gelatin. All the gelatin finally becomes liquid, and the green color is confined to the superficial layer in contact with the air.

Gonococcus.—The gonococcus grows well on blood serum mixed with agar. The gonorrhœal pus should be mixed with uncoagulated serum and the mixture added to one or two parts of melted agar at about 40° to 50° C. This mixture is allowed to solidify in an oblique position in the tube. The late method is the one commonly employed. Superficial colonies are described as having a compact centre with a very delicate, transparent, finely granular zone with projections like peninsulas on a map. Deeper colonies are solid, clumpy, with a sharp, regular contour.

Pneumococcus.—The pneumococcus seems to grow best at rather higher temperatures than that of the room (at about 78° to 79° F.) and upon a strongly alkaline medium or blood serum. The colonies appear small, distinct, round, and transparent, resembling dew drops.

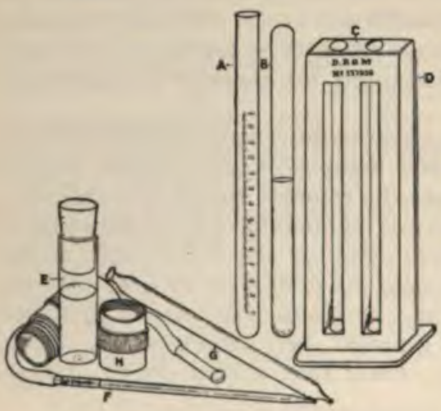

FIG. 9.—HÆMOGLOBINOMETER.

BLOOD

Examination.—For the examination of the blood, the apparatus necessary includes:

A hæmoglobinometer (Gowers's or Fleischl).

A Thoma-Zeiss counting apparatus.

Microscope slides, cover glasses, etc.

Gowers's Method.—To estimate the relative amount of hæmoglobin in a given case, the tip of the finger or lobe of the ear is punctured after having been thoroughly cleansed with alcohol or ether. The blood is drawn by suction into the pipette up to the 20 c.m. mark. Any trace of blood that may adhere to the outer surface of the pipette is carefully wiped off and the contents are at once mixed with a few drops of distilled water previously placed in the graduated tube so as to guard against the blood coagulating on its walls. Clean out the pipette as carefully as possible, so that every particle of blood is washed into the tube. Hold the two tubes side by side directly against the light, and add distilled water, drop by drop, until the shade of color is the same in each tube. The division on the scale thus reached will express the relative percentage of hæmoglobin. The *Tallquist hæmoglobin scale* greatly simplifies the estimation of hæmoglobin. A drop of blood is allowed to soak into a prepared blotting paper, which is sold as leaves of a small book. While it is still moist, compare its color with a color scale representing the different percentages of hæmoglobin.

Counting the Cells.—Counting of the blood cells is a trying and tedious procedure, but is of great value in many cases. The apparatus consists of a slide (*a*), upon which is arranged a chamber (*b*) the floor of which is marked most accurately into little squares (*c*). The chamber is exactly 0.1 mm. in depth, and each of the sixteen small squares contains $\frac{1}{4000}$ c.mm. A capillary pipette with a bulb on the upper third has graduations marked 0.1 mg. to 1.0, while above the bulb it is marked 101.

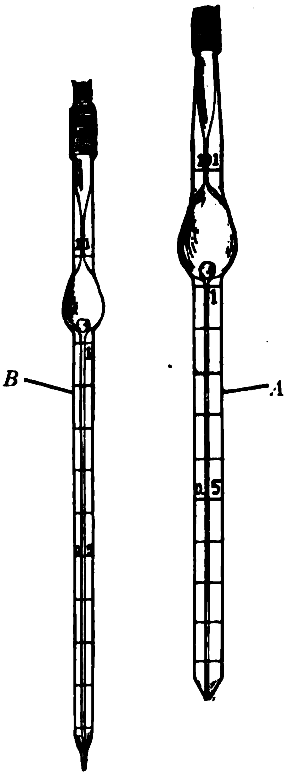

FIG. 10.—THOMA-ZEISS PIPETTES.

The tip of the finger or lobe of the ear is punctured after thoroughly cleansing the parts and apparatus. The finger should be cleaned with soap and water, then with alcohol and ether. The exuding blood is drawn into the capillary tube to the mark 0.5 or 1.0, according to the degree of dilution desired, care being taken to exert very slight pressure upon the finger. Then, after wiping the tip of the pipette, sufficient 6 per cent salt solution is drawn into the pipette to fill the bulb and reach the 101 mark. Mix thoroughly by shaking. Blow out the contents of the capillary tube below the bulb, as they are probably only salt solution, and then blow a drop of the mixture upon the counting chamber, immediately covering it with a cover glass (*f*), bubbles of air being carefully expelled. After allowing the corpuscles three to five minutes to settle, they are then counted, going over at least one whole field (200 squares) or, if special accuracy is desired, two whole fields (400 squares) when counting the red cells and 400 squares when counting the leucocytes.

In order to obtain the number of red corpuscles contained in one c.mm. of blood, the total number noted is divided by the number of small squares counted, the result being the average number in one small square. Example: Suppose 1,200 red corpuscles were counted in 400 small squares, the average number contained in one, that is $\frac{1}{4000}$ c.mm., of diluted blood would be 3,—corresponding to 12,000 corpuscles for each cubic millimetre. If the blood is diluted 200 times, multiplying by 200 would give 2,400,000 in one c.mm. of the undiluted blood. Drs. Einhorn and Laporte have

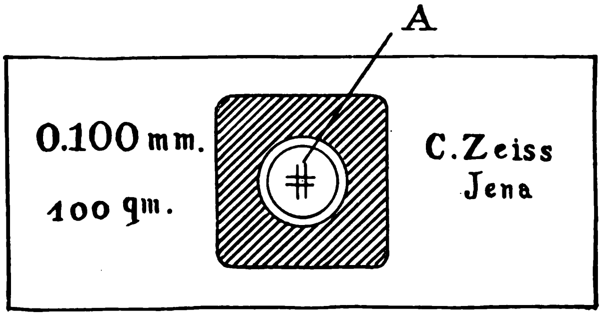

FIG. 11.—COUNTING SLIDE (plan).

invented a rapid blood counting method by means of a blood counting diaphragm manufactured by Eimer & Amend, of New York City.

In counting *leucocytes*, it is better to have a special pipette, allowing a dilution of from 1 to 10 or 1 to 20. For diluting, a 0.3 or 0.5 per cent solution of acetic acid is used, which destroys the red blood cells. The same method of mixing, preparing the drop on the slide, and counting is done as for red cells. Red cells are normally 5,000,000 per c.mm.; leucocytes, from 5,000 to 8,000.

Significance of Hyperleucocytosis

Physiological.—In children, Hayem says, 18,000 are found in the first eighty hours of life, 9,000 during the first month, and 8,000 up to the fourth year. They are also found during digestion, immediately after a cold bath, and during the last five months of pregnancy.

Pathological.—"Leucæmia" is not usually classed under "hyperleucocytosis." The latter term is generally employed to indicate an increase in the multinuclears in transitory conditions. Leucæmia is a permanent condition. In leucæmia the proportion of white cells may be 1 to 10 or 1 to 5, or 1 to 1 of the red cells, while normally it is about 1 to 8,000 or 1 to 10,000.

In acute inflammatory diseases, in general the degree of hyperleucocytosis is directly proportionate to the degree of local reaction. For example, in typhoid fever the local reaction is slight, but if there is a complicating pneumonia or pleurisy in which the local reaction is great, a correspondingly marked hyperleucocytosis will be found.

In pneumonia the degree of hyperleucocytosis may serve as a direct index of the amount of lung tissue involved, disappearing during the crisis or even a few hours before it sets in. In phthisis it occurs apparently only when the disease has led to the formation of cavities (secondary or mixed infection). In the *cachexia of malignant disease* it is often of great intensity, and it is said to be of value in the differential diagnosis between malignant and benign disease of the stomach.

PREPARATION OF BLOOD SLIDES

Preparation of blood slides, for the *examination* of the *blood cells* and for *Plasmodium Malariæ.* After scrubbing the finger tip or lobe of the ear with soap and water, and then with alcohol and ether (it often suffices to rub well with ether alone), a blood drop is drawn with a sterile lance or needle. Then pass the end of a slide, cleaned with ether and alcohol, through the drop and smear over the properly cleaned slide. It must be most carefully done, and no grease must be on the slide.

It is first stained with Jenner's alcoholic solution of eosin, or methylene blue 5 to 10 minutes, the slide being examined from time to time to see if the depth of stain is sufficient. When sufficiently stained, it is washed with water, and dried, and is then ready for examination under the microscope. A 1-12 oil immersion lens should always be used when possible.

DISEASES REQUIRING BLOOD EXAMINATION

Chlorosis.—In chlorosis we observe: Diminution of hæmoglobin, 60 per cent to 20 per cent; low hæmoglobin index = ratio between the percentage of hæmoglobin and the number of red cells; the number of red cells may be nearly normal, rarely less than 2,000,000; the red cells show a large unstained central area, indicating a loss of hæmoglobin; in severe cases the shape and size of the red cells may be changed, and nucleated red blood cells, called normoblasts, are often seen; the leucocytes are usually but little affected. There may be a slight increase in all varieties.

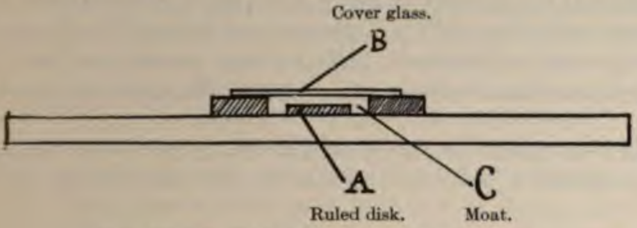

FIG. 12.—BLOOD COUNTING SLIDE (elevation).

Secondary Anæmia.—The blood is impoverished in all cases attended with malnutrition, toxæmia, or hæmorrhage. To make a diagnosis of this form of anæmia, we should first recognize the presence of a primary disease, such as carcinoma, ulcer of the stomach, nephritis, rhachitis, malaria, syphilis, etc., and then note in the blood examination: The hæmoglobin may be as low as 15 per cent; the red cells as few as 1,000,000; the hæmoglobin index not so low as in chlorosis; a moderate number of multinuclear leucocytes, the presence of which often characterizes the blood of secondary anæmia.

Pernicious Anæmia is a disease of the blood-producing organs tending to a fatal issue. On examination we find: the hæmoglobin usually below 25 per cent; the red cells always fewer than 2,000,000, and frequently below 1,000,000; the hæmoglobin index usually increased, as there is an increase of hæmoglobin in the remaining red cells; characteristic changes in the size and shape of the red cells, megalocytes; misshapen and deformed red cells of all sizes—poikilocytes; the hæmoglobin in many cells changed so as to make it stain brownish with eosin—polychromatophilia; nucleated red cells of large size, called megaloblasts, their presence in large numbers being pathognomonic of the disease; microblasts, staining brownish with eosin; red cells not collecting in rouleaux; the plasma of the blood perhaps staining with eosin, indicative of hæmoglobin solution in the plasma—hæmoglobinæmia; the leucocytes usually diminished, those remaining being principally of the uninuclear variety.

FIG. 13.—BLOOD COUNTING DIAPHRAGM. ACTUAL SIZE (Drs. Einhorn and Laporte).

Splenic Anæmia is classed as a disease of the spleen. It is usual to find a reduced number of red blood cells, the hæmoglobin is relatively low, and the leucocytes are reduced in number. The changes are associated with enlargement of the spleen.

Hodgkin's Disease has those changes in the blood of the microcytic form of pernicious anæmia.

Secondary Pernicious Anæmia.—The severe grades of secondary anæmia most frequently result from malaria, syphilis, carcinoma, nephritis, and tuberculosis. On examination we find:

The red cells may show an excess of hæmoglobin (megalocytic type), unless, as is usual in the very acute cases, they are normal or reduced in size and show a deficiency of hæmoglobin (microcytic type); megaloblasts are usually absent; a persistent multinuclear leucocytosis usually serves to distinguish the blood of secondary from that of primary pernicious anæmia.

Leucæmia.—A disease of the blood and blood-producing organs characterized by progressive anæmia, increase in the white cells of the blood, and certain changes in the viscera. In many respects it resembles a tumor formation in a fluid tissue.

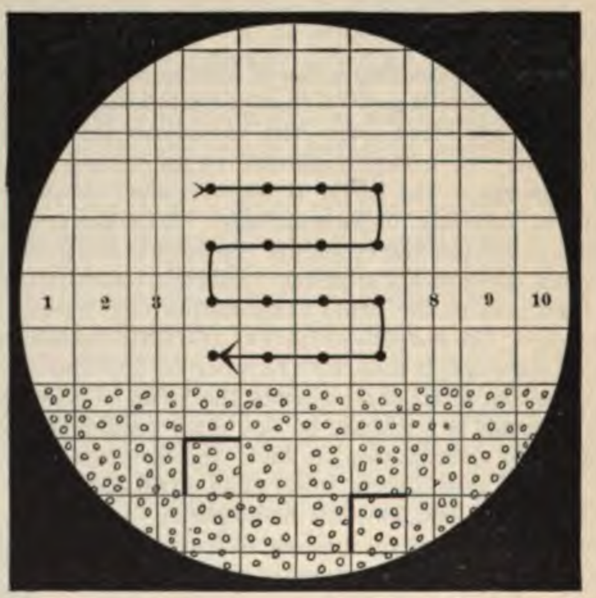

Fig. 14.—Counting Blood Cells.

Myelogenous Leucæmia.—The chief feature of the blood in this form is the presence of a large number of myelocytes and multinuclear leucocytes.

There are three varieties of myelocytes: 1. Ehrlich's myelocyte, of the same size as the multinuclear leucocytes, with a single pale central nucleus and neutrophile granules. This form is seen in secondary anæmias, but is abundant in myelogenous leucæmia. 2. Cornil's myelocyte, a very large cell with a single pale eccentric nucleus and neutrophile granules. This cell is seen almost exclusively in this disease. 3. The eosinophile myelocyte, a uninuclear leucocyte with unusually large and darkly staining eosinophile granules. This cell has been observed only in this disease.

Mast cells are seen in considerable numbers only in chronic myelogenous leucæmia.

Lymphatic Leucæmia.—In this form the increase is of the small and medium sized lymphocytes, while multinuclear leucocytes are scanty and myelocytes and mast cells are absent.

Malarial Parasites.—The plasmodium of malaria has its life process in the red blood cell, and it discharges the embryo into the plasma, this discharge being simultaneous with the chill. There are three forms:

1. The *tertian*, which gives a chill every forty-eight hours. 2. The *quartan*, every seventy-two hours. These two forms are very much alike, and can readily be demonstrated under the microscope. 3. The *æstivo-autumnal* type usually gives paroxysms every seven days and is undisturbed by quinine, except the chill, which is arrested. All these forms can be studied when they are alive in fresh blood or in stained specimens.

To study a fresh specimen of blood, the fingers, slide, and needle should be scrupulously clean and aseptic. A small drop of blood is placed upon the slide and a cover glass placed over it, when it is ready for study. The parasite is best studied in diagrams, where the different forms, indicating its degree of development, can be compared. Probably the best time to take a specimen is from twelve to eighteen hours after a chill, and the most characteristic feature is the granules of dark brown, nearly black pigment.

Widal Reaction.—This reaction depends upon the observation of Pfeiffer, that the action of the blood serum of a typhoid fever patient upon a minute quantity of a pure typhoid culture causes a loss of motility of the individual germs and also their so-called "clumping," an agglutination of the bacilli. It is found distinctly upon the fourth to the seventh day in 70 per cent of cases; upon the eighth to the tenth day in 80 per cent of cases; upon the third to the fourth week in 90 per cent of cases. It is absent throughout the disease in from 5 to 10 per cent of the cases. We also find all degrees of reaction. Sometimes there is an instantaneous loss of motility, sometimes in fifteen minutes, and sometimes there is only a partial loss of motion. Many other diseases give this partial reaction, only in low dilutions.

If the dilution of the blood is 1–10, and the reaction is present, the diagnosis is particularly certain; if 1–20, the diagnosis is absolutely certain. Absence of the reaction is not an assurance that the disease is not typhoid, but such cases are usually mild. The reaction is often slight or absent in cases ending fatally. In cases in which the Widal test is negative, infection with bacilli of the paratyphoid group should be suspected.

Procedure: A drop of blood from the patient is dried upon a slide just as it exudes from the finger punctured after due antiseptic precautions. Then dilute 1–10 times or 1–20 times with sterile water. Place on a cover glass by means of a platinum needle a drop of a twenty-four hour bouillon culture of the typhoid bacillus, or a pigment of an agar culture growth. Mix it with the diluted blood serum and invert it over the hollow of a slide made for the "hanging drop." In order to prevent all possibility of spreading any infection and getting a pure culture, the platinum needle should be held in the flame of a Bunsen burner or alcohol lamp both before and after each use. It is also a good plan to make a narrow ring of vaseline around the hollow in the slide for the hanging drop and to place the cover glass upon it to prevent slipping. The specimen is now ready for study. The Widal reaction seldom appears before the second week of the fever, and may be delayed even until convalescence. In a small number of cases it may never be present (paratyphoid?). In others it may be intermittent. As it seldom appears before the beginning of the second week, the test is of little value up to this time. As it often appears late in the disease, and as it may be present only intermittently, typhoid fever cannot be excluded by a single, or even by repeated negative tests. Repeated negative tests, however, are very strong evidence against the existence of typhoid. A positive reaction, if the patient has not previously had typhoid, is almost certain proof of typhoid. A negative reaction, followed by a positive reaction in a dilution of 1-50, is absolute proof of typhoid. The Widal reaction can also be determined by using serum instead of blood.

The reaction has been found by Scholtz as long as fifteen years after typhoid, and by Kasel and Mann as long as twenty-one years after recovery. If this were true, it would explain our practical immunity from a second attack. Cases of enteric fever presenting all clinical evidence of typhoid fever, but without the Widal reaction, are said to be due to a paratyphoid bacillus, and are termed "paratyphoid," for which a special test has been devised.

A macroscopic Widal reaction is obtained by taking up serum in a graduated pipette and diluting it to the desired degree (usually 1 in 40) with a live or dead (formalized) typhoid culture. The mixture is placed in a small test tube and allowed to stand. A time limit of three hours is set. A positive reaction is obtained when the bacilli are agglutinated and falling to bottom of tube leave a clear supernatant fluid.

Filaria.—Occasionally it is desired to examine the blood for the parasite causing elephantiasis, the *Filaria sanguinia hominis*. A peculiarity of the parasite is that it can be found in the blood only when the patient is at rest. So for one occupied during the day the blood specimen to be examined is taken at night, and vice versa. It can be found at any time.

Iodophilia.—This is a blood test first described by Dr. Theodore Dunham, of New York, who says: "I have ventured to coin this word to designate a reaction which occurs in the blood under certain pathological conditions. I bring this subject before you because this reaction has been a definite help to me in diagnosis, and I feel that it deserves a more extended use than it has yet received. The cases in which it gives aid are those of doubtful suppuration and doubtful pneumonia. We are not infrequently confronted with cases of appendicitis where an additional aid to the early recognition of pus would be of the greatest value; and there are other cases of deep-seated trouble with doubtful physical signs where an additional means of throwing light on the presence or absence of pus would be a great help. Pneumonia is often difficult of recognition during the first few days after the onset. An additional aid in diagnosing it during this stage would be of real value.

"Let me say a word about the technique of the reaction and then speak of its clinical bearings. The technique is very simple. It consists in the staining and examination of a spontaneously dried blood smear. The smear need not be stained at once, but will be good for use several weeks at least after making. It is thus possible to make the smear at the bedside and send it to the laboratory for staining and examination. Only one solution is required, and this is made up as follows: Three parts of potassium iodide are dissolved in one hundred parts of water. In this is dissolved one part of iodine. The resulting solution is thickened to a syrupy consistence by the addition of lumps of gum arabic and occasional shaking until they are dissolved. The blood smear is mounted in a drop of this syrup, and a bit of filter paper placed at an edge of the cover glass to absorb the excess of fluid. The specimen is then ready for examination by an oil immersion lens. When blood is treated in this way the lymphocytes and the eosinophiles are not affected by the stain.

"It is apparently always present in progressive suppurations and in progressive pneumonias. It may also occur in a few other diseases, but they are fortunately easy of recognition in other ways and not to be confounded with abscess or pneumonia. The intensity of the reaction is said by other observers to be closely related to the intensity of the process, and I have found this to be true in the cases I have examined. Small abscesses will, however, if the process be active, give a distinct reaction. In cases of so-called tuberculous abscess the reaction is absent. Abscesses caused by the germs of acute suppuration, but which are well walled off and have assumed an indolent course, rarely give the reaction. If, however, the process lights up again, the iodine reaction is said to return. Goldberger and Weiss, from an examination of a considerable number of other diseases as well as of abscess, reach the conclusion that a distinct intracellular iodine reaction, even if made out in only a few leucocytes, warrants the conclusion that there is present a progressive suppurative process. In reaching this conclusion, of course the few other lesions which give rise to iodophilia must be excluded.

"Let me now speak of the relation of iodophilia to pneumonia. Other observers say that the iodine reaction occurs constantly in pneumonia. I have found this to be true in the cases which I have examined. The reaction would not be of great value in pneumonia if it were present only when consolidation was so far advanced as to give a typical picture of the disease, for then the usual diagnostic signs are sufficient. But in two cases where I have examined the blood at an early stage, before physical or other signs were specially suggestive of pneumonia, I found a well marked iodophilia. This early appearance of iodophilia in pneumonia I have not seen referred to by others, and know of it only from the two instances where I looked for it. If it proves to be uniformly present soon after the onset, iodophilia will be one of the earliest diagnostic signs of pneumonia.

"As I have already said, certain diseases must be eliminated from the diagnosis before one concludes that iodophilia implies the presence of pus or pneumonia. Hofbauer, at Neusser's clinic in Vienna, found that iodophilia occurred in certain grave blood diseases. In eighteen cases of chlorosis he failed to find it. In eighteen cases of secondary anæmia he found it in two, but one of these was complicated by pyothorax and the other by gonorrhœal annexa, and its presence was probably due to these complications. But in really grave anæmia, as that associated with cancer of the stomach, severe chronic intoxications, etc., where the blood picture approached that of pernicious anæmia, he regularly found a greater or less number of iodophile leucocytes in the seven such cases he examined. In advanced pernicious anæmia and in leucæmia he also found it. I found it very marked in the one case of leucæmia which I have examined in this way.

"As iodophilia is a natural accompaniment of these diseases, in them its presence throws no light on the existence of pus or pneumonia. During an examination with the iodine test these grave blood diseases would surely be recognized. With their elimination, the finding of iodophilia points to acute suppuration or to pneumonia."

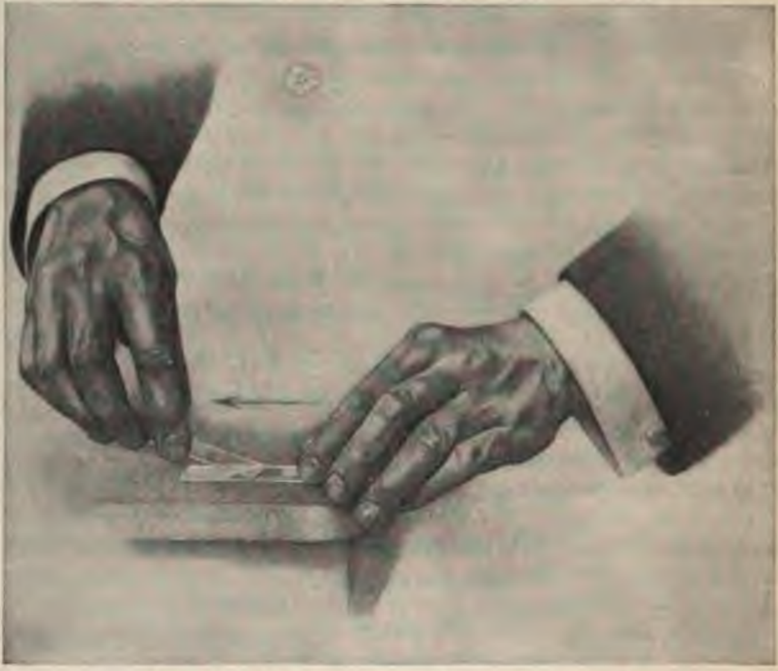

FIG. 15.—MAKING A BLOOD SMEAR ON A SLIDE.

TISSUE SPECIMENS

Preparation for Microscopical Examination.—The specimen is cut into a cube of about one and a half centimetres in each dimension. It is hardened by running it through the following solutions the specified length of time:

4	per	cent	formalin, ...	24	hours.	
80	"	"	alcohol, ...	24	"	
90	"	"	"	24	"	
100	"	"	"	24	"	
100	"	"	" and ether, each	24	"	
3	"	"	celloidin, ...	24	"	(better one week).
6	"	"	"	24	"	" " "

Block and leave in 70 per cent alcohol for twenty-four hours. Cut sections on a microtome. Stain in hæmatoxylin for from three to five minutes (Delafield's preparation diluted three times); H_2O + a few drops of ammonia, for a few seconds; H_2O for half an hour; alcoholic solution of eosin, for 1 to 2 minutes; alcohol, 90 per cent, for a few seconds; alcohol, 100 per cent, for a few seconds. Then place in oil of origanum, bergamot, or cloves until they are ready to mount in Canada balsam.

ANALYSIS OF DRINKING WATER

Chemical Examination. TESTS. — Test for total solids; hardness; chlorine; free and albuminoid ammonia; nitrates; nitrites.

The first three tests are a measure of the mineral constituents, while the last three show the organic contents of the water. If the history of the water is known, an excess of chlorine may point to sewage contamination. The free and albuminoid ammonia indicate animal and plant pollution. A large amount of nitrates usually shows that the water has been purified by oxidation. Nitrites should never be present to any amount in surface water.

Bacteriological Examination.—We wish to know if the water has been polluted by sewage; if there are bacteria, whence they are probably derived. The finding of the colon bacillus accompanied by the germs of putrefaction, if at the same time the chemical analysis shows an excess of nitrites or albuminoid ammonia, is sufficient reason to pronounce water unfit for drinking. The test for the colon bacillus and typhoid bacillus, with accompanying putrefactive bacteria, is accomplished by means of cultures and gross and microscopical examination.

CALCULI

Renal Calculi may be composed of uric acid, calcium salts, or phosphates. The nucleus is formed by a deposit from an excess of the crystalline particles of the urine. These particles become adherent through a bit of mucus or clot of blood, and fresh deposits are gradually added to the nucleus. The shape is usually irregular, conforming to the shape of the pelvis of the kidney and its branching calices.

Ureteral Calculi.—A stone from the kidney may descend into the ureter, and become lodged there.

Vesical Calculi have for nuclei uric acid crystals, a mass of inspissated mucus, or some small foreign body. They may be primarily formed in the kidney. We usually find them to be composed of urates and uric acid, phosphatic salts, or oxalate of lime. Rarely one is found composed of cystin. The framework which holds the crystals together is albuminous, and thus it is essential to stone formation, to have an abnormal urine, such as one containing inflammatory products, mucus, or blood, and one at the same time rich in salts. A stone may gradually increase in size so that in time it is possible for one to fill the bladder. Occasionally elongations extending into a ureter, the urethra, or a vesical pouch may form. One may begin in the prostatic sinus, and enlarge backward into the bladder or forward into the urethra. Vesical calculi may be multiple.

Urethral Calculi are rare, but it is possible to have a vesical or renal calculus lodge in the urethra behind a stricture.

Prostatic Calculi with nuclei of organic matter (prostatic secretion), upon which salts of lime may be deposited, may be found in the prostatic ducts or scattered throughout the gland.

Calculi with hair attached point to the presence of a dermoid cyst.

Gall Stones usually form in the gall bladder, but occasionally in the ducts or biliary passages of the liver. Cholesterin and bile pigments form the basis, but there must be some obstruction of the passages and inflammation of the mucous membrane to allow of their precipitation from stagnant bile. There may be a single stone or many, and the size varies from that of a small gravel to two to three inches in diameter.

Pancreatic Calculus.—Rarely a stone may form in the pancreatic duct.

Salivary Calculus.—Phosphate and carbonate of calcium may be deposited in a salivary gland or duct, forming a stone from the size of a grain to one of the size of a walnut.

Rhinoliths always have for a basis some foreign body which has been put into the nose or a mass of inspissated mucus. The irritation which is set up from their presence causes a precipitation of solids about this nucleus.

CYTODIAGNOSIS, CYTOLYSIS, ETC.

Cell Diagnosis.—By this term is meant diagnosis by means of the *chemical* and *microscopical* characteristics of the effusions into the serous cavities of the body.

If we have such a fluid to examine, we note its appearance, color, and density, and the presence of fibrin; we analyze it for its chemical composition; we examine it with the spectroscope; determine its freezing point (cryoscopy), its hæmolytic property, its agglutinating properties, and its toxicity. We look for bacteria, make cultures, and inoculate animals. Microscopically, we note the kind of cell contents.

In a pleuritic fluid we try to determine if it is from: 1. A tuberculous process: *a.* Primary; *b.* Secondary to a tuberculosis elsewhere in the body; *c.* Tuberculous hydropneumothorax. 2. Non-tuberculous process: *a. Septic*—Pneumococcus, streptococcus, bacillus of Eberth, etc.; *b. Aseptic*—Mechanical (cardiac or renal), leucæmic, cancerous, from abscess of the liver, syphilis, rheumatism, diphtheria.

If in the cellular contents we find that the *lymphocytes* predominate, it points to a tuberculous origin; if the multinuclear leucocytes predominate, it points to a pneumococcus or streptococcus origin. Simple endothelial cells are found in a passive effusion, and cancer cells in some stages of a cancerous effusion. It has been found that there are peculiar cell reactions to staining agents, so that we can determine whether the cells come from a primary or secondary tumor. If there are many tissue cells in a pleuritic fluid, we have good reason to suspect the presence of a neoplasm.

In a *peritoneal effusion*, we try to determine if it is a mechanical ascites,

ascites due to a neoplasm, acute peritonitis, tuberculous peritonitis, or fluid from an ovarian cyst.

In a *pericardial effusion*, we try to find whether it is tuberculous or renal.

In an *articular effusion*, it may be due to tuberculous hydrarthrosis, tuberculous arthritis, rheumatic arthritis, gonorrhœal arthritis, traumatic hydrarthrosis, tabetic arthropathy, or synovitis of simple origin.

In effusions into the *tunica vaginalis*, it may be from tuberculous hydrocele, gonorrhœal orchitis, typhoid orchitis, traumatic hydrocele, essential hydrocele, cyst of the cord.

We also examine the fluid from skin eruptions as seen in bullæ, vesicles, and pustules; as herpes, pustules of variola; blister from burning, accidental or artificial.

In particular, the examination of the *cerebrospinal fluid*, obtained by lumbar puncture, has been of aid in diagnosis. In the absence of cellular elements, we judge that there is no bacterial cause, that the symptoms are due to a polyneuritis or a poliamyelitis. When the meninges are affected, there are cell elements found. In the beginning of the paralytic period, due to a meningitis, when the inflammation is localized, we find a lymphocytosis, but when the inflammation is extensive, we find a multinuclear leucocytosis.

Cytodiagnosis of the cerebrospinal fluid seems likely occasionally to be of great help in distinguishing doubtful cases of paresis and tabes in the early stage. "In spinal syphilis, as shown in cases of syphilitic meningomyelitis, as Erb's spinal paralysis, there is an increase in the cell count, and if trauma can be excluded, the presence of specific infection may be inferred." The activity of the process may be judged also. "If any active inflammatory change be going on, polynuclear leucocytes will predominate, while in ordinary conditions of specific infection, only mononuclears are present, with a proportion of polynuclears of not over 5 per cent."

Cytodiagnosis of the cerebrospinal fluid promises to aid us in the diagnosis of tuberculous meningitis, pneumococcus meningitis, meningococcus meningitis, streptococcus meningitis, tabes, general paralysis, syphilis of the cerebrospinal system, meningo-myelitis, cerebral lesions, sclérose en plaques, tetanus, syringomyelia, affections of the peripheral nerves, chorea, neuroses epilepsy, mental affections, leucæmia.

CYTOLYSIS, HÆMOLYSIS, ETC.

Immunity and *serum therapy* have received a great deal of study during the last few years, and an immense amount of new knowledge has been obtained which opens great possibilities. With the exception of the marvelous results from diphtheria and tetanus antitoxine, we have not yet been able to apply this knowledge with any great success. When we apply the "side chain hypothesis" of Ehrlich, we can formulate the process which goes on in the body when one acquires immunity. Lack of space prevents a complete consideration of this subject, but a few definitions may aid in the understanding of the voluminous literature which has been and is appearing.

Antitoxins.—By *antitoxins* we mean substances generated in the fluids of the body by stimulation of the cells by irritation from bacterial or other toxins. This substance neutralizes the toxin and thus achieves an *active immunity.* If this toxic and antitoxic process takes place first in an animal which becomes immune, and the blood serum of this animal is injected into the body of a person suffering from the effects of the same toxin, we establish in this person a *passive immunity.*

Cytolysis is a destruction of cells by some toxic process.

Hæmolysis is a disintegration and destruction of the blood. This takes place through the formation of an *hæmolysin*, a substance formed by bacterial or other action and capable of destroying the red corpuscles. An hæmolysin is formed in the body of an animal into which red blood corpuscles of another animal have been introduced. This hæmolysin is capable of dissolving the red blood corpuscles of the animal from which the blood was derived.

Agglutinins are substances formed in the blood as a result of infection and capable of causing agglutination or coherence of the bacteria that produced the infection.

Precipitins are formed in a similar manner. If blood serum or exudate containing globulin from one animal is introduced into another animal of a different species to become adapted, the addition of a little of the blood serum of the adapted animal to a dilution of the fluid injected will form a precipitate. This reaction is supposed to lead to the identification of human blood, and it is hoped, as also it is hoped in these other processes, that important features in specific therapy will be discovered.

CRYOSCOPY

This word is used to designate the effort to determine the functional activity of the kidney by comparing the freezing point of the urine obtained by ureteral catheterism with that from kidneys known to be normal, and with the freezing point of the blood of the patient under observation. The principle involved is that a watery solution containing little solid matter will freeze at a higher temperature than one containing considerable solid matter. We should therefore expect that the urine from a diseased kidney, the eliminative function of which is thus diminished, would freeze at a higher temperature than normal; and that the blood of the same individual, through retention of solids, would freeze at a lower temperature than normal.

Much effort has been given to this subject, as it readily can be seen that if an operation is under consideration, particularly upon the kidney, it is of great importance to know the condition of the remaining kidney. Kümmell makes the following rule in cryoscopy: "The freezing point of normal blood is $-0.56°$ C. or higher; of normal urine, $-0.9°$ C. or lower. A freezing point of the blood of $-0.58°$ C. or lower, or a freezing point of the urine of $-0.8°$ C., shows a degree of renal impairment which makes operations upon the kidney dangerous and unjustifiable."

"The following propositions have been emphasized: 1. The freezing point of the blood, notably depressed in cases of renal sclerosis, can be raised in the presence of chronic parenchymatous nephritis. 2. The freezing point of the urine, which may be normal or slightly elevated in parenchymatous nephritis, is much higher in cases of renal sclerosis, even approximating that of the blood serum itself. Hence, 3. Inferences as to the condition of the kidneys are justified only by a consideration of the freezing point of both fluids, as well as of the total quantity of urine."

"Uræmia, renal insufficiency, and renal permeability must be carefully distinguished; they do not vary in constant ratio one with another. Uræmia can coexist with permeable kidneys."

Test: The test is simple. All that is required is a centrigrade thermometer, a large test tube, and a freezing mixture of ice and salt in a wide necked glass bottle. Two ounces of blood are drawn from the medium basilic vein with a cannula into the glass tube. Coagulation is prevented by constant agitation. The tube and thermometer are immersed in the freezing mixture. The freezing point of normal blood is 0.56° C. to 0.57° C. This test is made prior to a contemplated nephrectomy. A freezing point of 0.59° C. demands caution. A freezing point of 0.60° C. is a positive contraindication to any operative interference on the kidney (Kümmell, of Hamburg). Cryoscopy in connection with cystoscopy, segregation of urines, and the phloridzin test is to be regarded only as an aid to diagnosis —the examination should be prolonged over a number of days. (See also Renal Insufficiency.)

Kapsammer has observed that the freezing point of urine may be influenced by reflex polyuria from catheterism of the ureters. The result of this new method should be accepted cautiously.

PHLORIDZIN

Normal kidneys, according to present information, permit of the prompt transformation of phloridzin, injected subcutaneously, into sugar, while diseased kidneys fail to accomplish this transformation just in proportion to the lesion of the secreting cells.

Caspar and Richter emphasize, as a preliminary to operation in cases of suspected renal insufficiency, the importance of estimating three factors—the quantity of urea excretion, the amount of sugar excretion after injection of phloridzin, and cryoscopy. They express the utmost confidence in the conclusions based upon these premises.

DIRECTIONS FOR PREPARING SPECIMENS

Serum Culture for Diphtheria.—Rub the cotton gently but freely against any visible throat exudate and subsequently rub the swab thoroughly over the surface of the blood serum. Do not allow the swab to touch anything but the throat and the serum.

Urine.—Collect in a clean glass. To preserve it, add a few drops of chloroform or crystals of thymol.

Sputum.—Collect and send in clean wide mouthed bottles.

Blood.—For the malaria test. After carefully washing, prick the lobule of the ear or the tip of the finger, wipe away the first drop of blood, catch a minute drop of blood on a clean cover glass, cover the same lightly with a second glass, draw them quickly apart, and allow to dry.

Widal Test.—Place several separate drops of blood on a slide and allow them to dry without spreading.

Red and white blood corpuscles can only be counted in a specimen accurately diluted. To determine the hæmoglobin, use Tallquist's blotting paper at the bedside.

Tumors and scrapings can be preserved in a 2 per cent solution of formalin in sterile bottles.

CHAPTER II

GENERAL THERAPEUTIC MANAGEMENT

SYNOPSIS: Fever Diet.—Convalescent Diet.—Nutrient Enemata.—Subcutaneous Alimentation.—Gavage.—Lavage.—Low and High Flushing of the Colon and Colon Inflation.—Antipyresis by Medication.—Hydrotherapy, Baths, Packs, Douches.—Balneotherapeutics.—Stimulation.—Cold Air.—Enteroclysis.—Apparatus for Infusion and Hypodermoclysis.—Drug Stimulation.—Management of Dyspeptic Symptoms.—Coated Tongue, Nausea, Vomiting, Thirst, etc.—Laxatives.—Diaphoretics and Diuretics.—Expectorants, Cough Mixtures, Inhalations.—Dyspnœa.—Pain in Acute and Chronic Illness.—Nervousness.—Insomnia in the Absence of Pain.—Counter Irritants and External Applications.—Venesection and Local Depletion.—Nasopharyngeal Toilet.—Tonics in Convalescent Stage.—Remarks on Mental Therapeutics.—Dose Determination.—Practical Rules and Tables for Converting Apothecaries' Weight into that of the Metric System.—Invalid Bed.

INTRODUCTORY REMARKS

Therapeutics is the treatment of disease, not by medicines alone, but by any and all means and appliances. The only reliable basis of therapeutical knowledge is clinical experience.

The general therapeutic management embraces the treatment of symptoms and conditions usually met with in acute and chronic ailments.

In the absence of specific medication, which at the present time we have only for a very few diseases (diphtheria, malaria, syphilis, etc.), the management of acute febrile diseases is mainly hygienic and dietetic, coupled with the employment of rational antipyretic measures, timely stimulation, and careful attention to annoying or grave symptoms.

The similarity of treatment particularly in all acute febrile affections makes it advisable, in order to avoid repetition, to discuss the *general therapy* in this separate chapter, to which the reader will be referred as the various diseases come under consideration.

FEEDING IN SICKNESS

Fever Diet.—A so called fever diet is essential in all febrile diseases or conditions. The food should be fluid or semisolid, so as not to overtax the feeble digestive apparatus or leave a large residue in the intestine for decomposition, which would be apt to favor autointoxication or local irritation.

The attending physician will do well to write out a diet on a prescription blank or on the history chart to be kept by the nurse, and he may select from the list of liquid and soft diets to be found in the chapter on Nutrition and Diet such articles as the patient may naturally desire, the list having been compiled with a view of meeting the demands of the adult sick.

Breast fed or bottle fed children when ailing will naturally take less food than in health, particularly if kept in ill ventilated, hot, and stuffy rooms; but they will not require a change of food except in *diarrhœal diseases*. A dilution of their ordinary bottle food or a longer interval between feedings is therefore indicated, and no special concern need be entertained if the little patient refuses to take its usual quantity of food.

Boiled water should be offered to adults and children to quench thirst and favor excretion and elimination by skin discharges, the quantity of water to be given depending upon the requirements of each individual case. As pure water is not poisonous, it will never do harm. This rather superfluous remark is made for the encouragement of colleagues addicted to the drugging evil and more ready to prescribe drugs than to offer water.

Special Diets.—For children who no longer take the bottle, we may select food from the following list: Water, toast water, farinaceous water, gum arabic water, white of egg in water, peppermint tea, imported ginger ale, black tea, milk, matzoon, kumyss, buttermilk, whey, sterilized, Pasteurized, peptonized, or malted milk, beef broth, mutton broth, chicken broth with and without egg, beef jelly, soups, gruels, cornstarch pap, pea soup, burnt flour, soup, eggnogg, tropon or somatose in peppermint tea, custard, ice cream, water ices, orange or pineapple juice, unfermented grape juice, champagne, California Tokay wine, whiskey in water.

Milk is contraindicated in dyspeptic and inflammatory diarrhœas and in cases of milk idiosyncrasy, and also in cases of typhoid fever when the abdomen is markedly tympanitic. When milk is contraindicated, the following articles on the list may be offered: Water, toast water, farinaceous water, black tea, gum arabic in water, white of egg in water, beef or mutton broth and egg, pea soup, and burnt flour soup. The latter is particularly useful in diarrhœal disorders.

An exclusive milk diet is indicated for infants up to eight months, and many practitioners favor an exclusive milk diet in cases of typhoid fever, in acute and chronic Bright's disease, in acute pyelitis, in chronic gastric catarrh, in gastric ulcer and cancer, in scarlatina, in neurasthenia, and in the Weir Mitchell rest cure. The writer is not convinced that a rigid milk regimen is superior to a more liberal bland mixed liquid diet.

Peptonized Milk and Meat.—Peptonized food or predigested food is sometimes serviceable when the digestive power is feeble, but in children it is frequently ordered unnecessarily and in cases in which it is positively harmful, as it adds to the intestinal putrefaction. This is particularly true when it is used for a long time. Under no circumstances should it be employed other than as a temporary makeshift.

The writer seldom employs peptonized milk for children, and much prefers to aid digestion by administering a few drops of hydrochloric acid in sugar water after eating.

Sarcopeptones, or Beef Peptonoids.—These are sometimes useful to tide over a critical period. If given for any length of time, they favor a putrid condition of the gastroenteric tract. Beef or sarcopeptones are obtainable in the shops in a liquid or semisolid form, or they may be prepared by treating beef with an extract of pancreas, which is prepared by macerating for one week the pancreas of a pig, calf, or sheep with four times its weight of 50 per cent alcohol and filtering.

RECTAL ALIMENTATION—NUTRIENT ENEMATA

Feeding by the rectum is useful in feeble digestion and in cases in which food is not tolerated by the stomach, or to supplement a feeble stomach or inability to swallow, or in gastric ulcer and incessant vomiting, also in the insane. Before injecting food into the rectum, the latter should be cleaned by an enema. The patient is placed on the back with the thighs elevated, and a rubber tube of proper length is inserted into the rectum as far as it will go. The fluid food, consisting of an artificial fat emulsion or of milk or gruel with egg, whiskey, or peptonized food or somatose in watery solution, is allowed to flow into the rectum from an irrigator or fountain syringe. Various medicinal substances may be added to the enema if desired. Children will retain from two to eight ounces, and adults up to a pint. When the rectal tube is withdrawn, the buttocks may be pressed together to prevent the escape of fluid.

Feeding in infectious fevers is a matter not clearly understood, for we practically know nothing regarding the difference in the behavior of microbes in a starving and in a well nourished body. A child of seven, requiring a daily food value of 1,400 calories in health, probably takes only half a pint of eggnogg or one pint of milk in twenty-four hours when sick and feverish (which latter is equal to 400 calories), as in septic scarlatina with diphtheria, and rapidly emaciates, while some children take nothing or vomit everything given them. Now, the question is: Shall we let Nature take her course for a few days, or shall we endeavor to feed the body by nutrient enemata? As the body *fat* is first burnt up in fever, we may wait a certain time, but not too long. Nutrient enemata are poorly absorbed; therefore we must not expect too much from rectal alimentation, *for it will have but little influence in counteracting the pernicious action of bacterial products or toxins on the nerve centres.*

SUBCUTANEOUS FEEDING has been adopted to tide the patient over a critical period. The following formula has been used:

Grape sugar,	ʒss.;
Table salt,	ʒss.;
Pepsin peptone,	ʒj;
Water, ad.	℥jv.

This to be injected under the skin in divided doses in twenty-four hours in severe cases of gastric ulcer or intestinal obstruction. Reports on the value of subcutaneous feeding are not encouraging.

A preparation containing soluble albumin and table salt sold under the name of *kalodol* may be resorted to for subcutaneous feeding.

Diet in the Convalescent Stage.—In the convalescent stage a liquid and soft diet may be selected from the list given in the chapter on Nutrition and Diet, with due consideration of the patient's natural likes and dislikes.

In the case of breast fed and bottle fed children, we gradually return to the food given when the child was in good health, unless the former method of feeding was faulty, in which case we select the proper food (see Infant Feeding). Older children may take in addition to their milk some of the following articles: Well cooked cereals, cornstarch pap, bread pudding, scrambled eggs, apple sauce, baked apples, scraped meat, calf's foot jelly, beef jelly, milk toast, sponge cake, biscuit, bread, zwieback, etc.

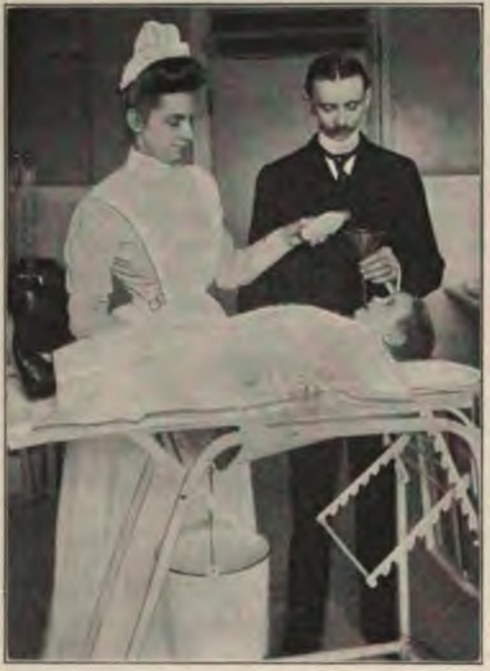

FIG. 16.—GAVAGE.
Feeding by means of the stomach tube.

GAVAGE

Feeding by the stomach tube is accomplished by means of a soft catheter (No. 12 to 14) and a glass receptacle (a funnel of 8 oz. capacity), as shown in the cut. Adults require a large tube and funnel. In rebellious patients a mouth gag should be used, or the tube may be introduced through the nostril.

Indications for Gavage.—1. When patients refuse to take food, as in septic fever and coma, when rectal alimentation is inadequate. 2. In intubation cases when children cannot swallow or refuse to swallow. 3. In habitual vomiting. Babies are sometimes unable to retain food which is swallowed, but manage to keep it down when given by gavage. 4. In premature infants and cases of malnutrition.

As soon as the food is in the stomach, the soft tube is pinched with the thumb and forefinger and rapidly withdrawn. The infant is not taken up until some time has elapsed, to prevent vomiting or regurgitation. In an infected stomach, lavage should precede gavage.

FLUSHING THE STOMACH AND BOWELS

Stomach Washing—Lavage

The most convenient and at the same time thorough way of washing a stomach is by means of the apparatus shown in the illustration. For children a fountain syringe is attached to a glass T cannula which has a flexible catheter at one end and a waste tube at the other. Adults swallow a soft rubber stomach tube—the wash water is introduced by means of a large funnel, which when lowered allows the fluid to return by siphon action. The stomach tube for adults is two feet long and joined to the rubber tubing by means of a glass cannula. The funnel holds one pint. One or two funnelfuls are let in at a time and siphoned out by lowering the funnel. A return flow will be interfered with if the tube is bent upon itself or above the level of the fluid or blocked by food, etc.

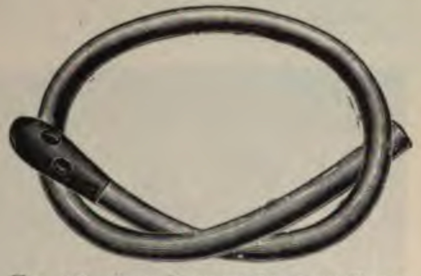

FIG. 17.—SOFT RUBBER STOMACH TUBE.

Two to four quarts of boiled lukewarm water in which a tablespoonful of sodium bicarbonate has been dissolved may be used at one sitting. Weak persons should be treated in bed.

Average distance, 55 to 60 cm. from the teeth. Contraindications: Heart disease (advanced), aneurysm, recent hæmorrhages, including apoplexy, advanced pulmonary disease, ulcer with recent hæmorrhage.

These rules do not hold good for all emergencies.

In case of necessity the tube can be introduced through the nostril,

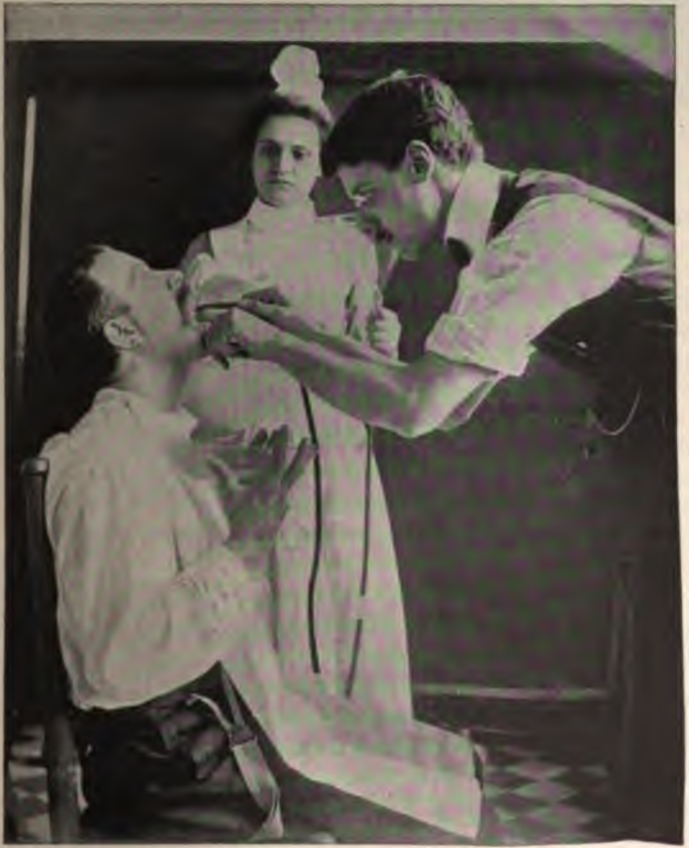

FIG. 18.—STOMACH WASHING IN ADULTS.

in which position it will not be possible for any unruly child or insane adult to bite it.

The child is held upright in the nurse's lap with the head secured in a forward position to allow saliva and vomited matter to escape by the mouth. In introducing the tube there is a slight hitch at the entrance of the œsophagus, but it is easily overcome. When the tube is too large, it will compress the larynx, and young children appear flushed and slightly cyanotic. When the clear cry of the child is heard, we know that the tube is not in the larynx. In letting in the water the stomach must not be filled to overflowing, unless it is necessary to expel large curds which would not go through the catheter No. 12 or 14. Overflowing the stomach is safe only when the child's body is bent forward or it lies on its side. Stomach washing is an easy procedure in infants and children under two years. Stomach washing may also be accomplished by means of swallowing warm water in the ordinary way and inducing vomiting by irritating the pharynx by the introduction of the fingers into the throat.

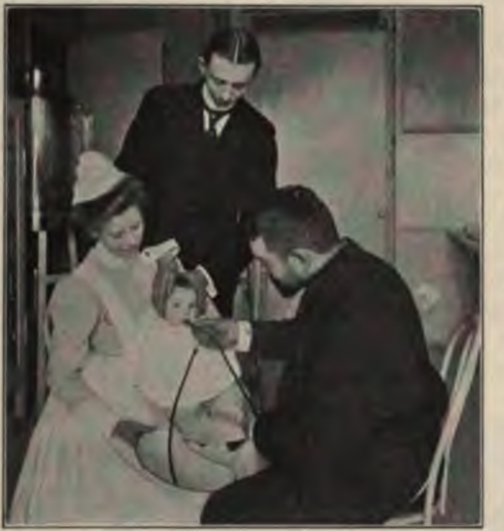

Fig. 19.—Stomach Washing in Infants by means of a Fountain Syringe, at an Elevation of Four Feet.

A T cannula connects reservoir stomach tube and waste pipe.

Stomach washing in children is occasionally indicated: In acute gastritis, in acute poisoning, in cholera infantum, in chronic indigestion with atony of the stomach (to remove undigested food and foreign matters), in difficult feeding cases, in persistent vomiting, and previous to operations on the stomach.

When it is necessary to simply clear the stomach of its irritating contents, a single washing is sufficient. In chronic cases washing every other day is necessary. The irrigation fluid is boiled water at the temperature of the body. Occasionally it is well to add a teaspoonful of bicarbonate of sodium to a pint of water to make it alkaline. Gavage is contraindicated in collapse.

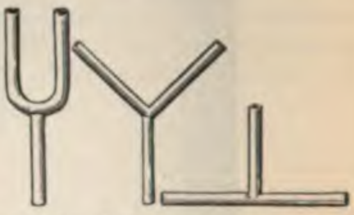

Fig. 20.—T Cannula for Irrigation.

Enteroclysis—Low and High Enemata and Colon Inflation

Flushing the colon in children and adults is accomplished by means of a soft rectal tube in the manner shown in the cut (soft rubber irrigating tube and a fountain syringe).

The colon may be distended with boiled water, medicated water, starch water, soap suds, oil, air (by bicycle pump inflation), or carbonic acid gas (from an inverted siphon). Liquids as a rule do not penetrate farther than the ileocæcal valve, but indirectly the entire gut will profit by lavage, by bringing down the contents from the small intestine and clearing the colon of putrid material. The value of irrigation depends somewhat upon the absorption of water by the large intestine.

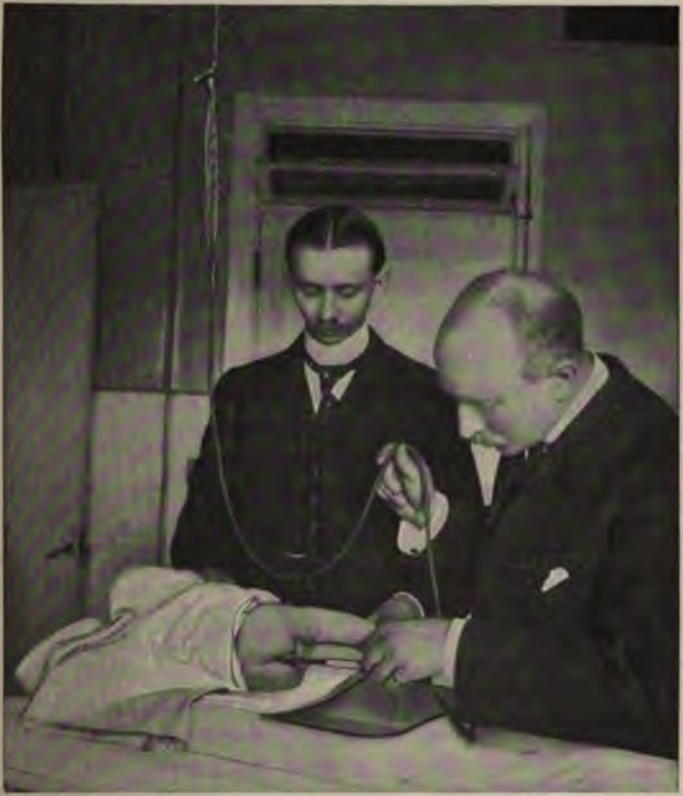

FIG. 21.—BOWEL IRRIGATION IN INFANTS AND CHILDREN.

High Enemata.—The high enema is administered through a long catheter (colon tube) attached to a fountain syringe: To secure bowel action (use soap suds water, one half to two pints at a temperature of 101°–103° F.); to stimulate in circulatory failure; to prevent shock and collapse before chloroform anæsthesia, and before and after operations; in renal insufficiency, uræmia (irrigate for twenty minutes at 110° with Kemp's flexible tube); in jaundice (irrigate with cold water at 60° or warm water at 110° F.); to reduce temperature (irrigate at 60°, 70°, 80°, or 90° F. Cold irrigations depress the heart); to replace lost fluids (irrigate at 110° F. as in weakness from hæmorrhage); to overcome intestinal obstruction; to nourish per rectum.

Low Enemata are given with a short tube and have about the same indications as high injections, but are not quite so effective. They are sometimes useful in subacute local inflammations of pelvic organs, but are ordinarily employed to secure bowel action. *Colon Inflation* by means of medicated water, oil, or gas, is practised to overcome bowel obstruction, and will be discussed more fully in the chapter on Intussusception.

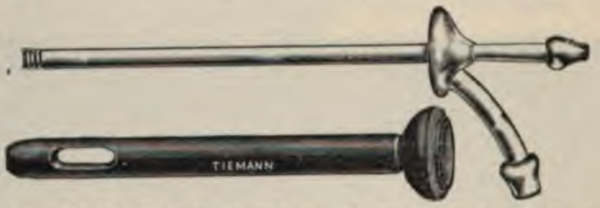

FIG. 22.—KEMP'S RECTAL IRRIGATOR (DOUBLE CURRENT CATHETER).

ANTIPYRETIC MEASURES

Fever is characterized by a rise of temperature plus a disturbed metabolism. A normal temperature is maintained by a complicated system of heat regulating apparatus, the details of which are more of physiological than of clinical import. An increase of temperature is usually accompanied by increased frequency of respiration. In fever there is a contraction of surface capillaries; the skin cools off and the patient experiences a chilly feeling. Occasionally chills are observed with a high temperature, a reddened skin, and distended capillaries. A nervous chill is accompanied by no rise in temperature. In order to produce fever by infection, bacteria or other products must actually enter the circulation. The same holds good for Protozoa (malaria). We have no definite knowledge regarding the purely nervous irritation of the heat centres. The predisposition to high temperature varies with the individual and his age and condition. Young and strong individuals have a higher range of fever heat than the weak and aged. As a rule a continued high temperature is accompanied by loss of appetite and by inanition. Here again there are exceptions. The writer has known children and adults to have a temperature of 104° for over a week, though still an excellent appetite.

The significance of fever for the organism is still a mooted question. On the one side fever is looked upon as a direct danger, and contrawise a high temperature is looked upon as favoring a limitation of diseased conditions. In many instances the thermometer has proved a stumbling block instead of an aid in practice, and even intelligent practitioners are frequently made uneasy by a rise of temperature in a patient, and resort to "premature antipyretic measures," thereby distorting the clinical picture of an ailment the nature of which is still in doubt.

Naturally our therapeutic efforts will vary according to our personal conception of such conditions. At the present time we are still in the dark regarding these points, and we do not exactly know whether fever due to infection is favorable or unfavorable to the animal economy.

Our knowledge of subnormal temperature is meagre. Subnormal temperatures are not uncommon, and a continued subnormal temperature is a grave symptom, particularly in diseases usually characterized by high fever. Thus our antipyretic measures or efforts by means of hydrotherapy or chemical antipyretics may or may not be of value in a given case, but are probably rational as favoring increased elimination.

DRUG ANTIPYRETICS

Quinine as an antipyretic is indicated only in malarial fever. It is useless and often dangerous to depress the temperature by large doses of quinine in any other class of cases.

Antipyrine, phenacetine, acetanilide, and lactophenine, also citrophen, may be used occasionally, one or two doses in the evening, when the temperature is at its highest, in order to reduce it for a few hours and overcome if possible the cerebral restlessness which makes sleep impossible. The routine and frequent administration of antipyretics as soon as the temperature reaches 103° is bad practice.

Quinine Saccharinate (sweet quinine).—This new quinine product is now obtainable. It contains 67 per cent of the alkaloid and is therefore quite as efficient as the sulphate. It comes in crystal form or in compressed tablets, and is destined to take the place of the ordinary bitter quinine preparations. The dose is the same as that of the sulphate. *Euquinine* is a tasteless quinine preparation of about the strength of the sulphate, and has the same therapeutic indications.

Quinine Sulphate (hydrochloride).—*Dosage:* Antipyretic dose, gr. 3 to 15, suspended in compound elixir of taraxacum or in honey or given in a wafer.

Antipyrine (soluble in water).—For children, single dose, gr. 1 to 3; for adults, gr. 5 to 15. Also per rectum in double dose.

Phenacetine (insoluble in water).—Sedative and antipyretic, gr. 5 to 15 for adults; gr. 1 to 3 for children, several times a day.

Lactophenine (somewhat soluble in water).—Sedative, antipyretic; dose, gr. 5 to 15 for adults; gr. 2 to 3 for children, several times a day.

Citrophen.—Same indications and dosage as phenacetine.

Acetanilide (antifebrin).—Dose, gr. ½ to 2 for children; gr. 3 to 10 for adults, several times a day.

HYDROTHERAPY, BALNEOTHERAPEUTICS

Hydrotherapy plays a most important rôle in the management of acute and chronic illness by reason of the antipyretic and stimulating effects of baths, packs, and douches. The "hydrotherapeutic reaction" is the natural reaction of the body to heat or to cold. The temperature of the water should not be much above or below 90° F.

THE COLD BATH.—When a person plunges into cold water or has a cold douche applied over a considerable area, he shivers and then takes a deep inspiration. The skin is cold and pale, but upon his leaving the water, if the reaction is present, it becomes red, and he feels a sense of warmth and breathes more easily. Voluntary motions, friction of the skin, and the general health and strength of the individual, as well as the temperature of the water, the length of the bath, and the force of the douche, govern the degree of the reaction. To one accustomed to the initial shock it is agreeable, and the reaction is more easily obtained. The flow of urine is increased, the action of the bowels is promoted, the appetite is stimulated, digestion is aided, and the nervous and muscular systems are toned up.

THE WARM BATH is sedative. The superficial vessels are dilated and there is a sensation of warmth. The respirations are increased in frequency. Perspiration is increased. The sedative action is shown by the desire afterward for rest and repose, while the effects of a cold bath are just the opposite—a desire and ability for physical exertion, an increased energy. Hot applications tend to make one constipated.

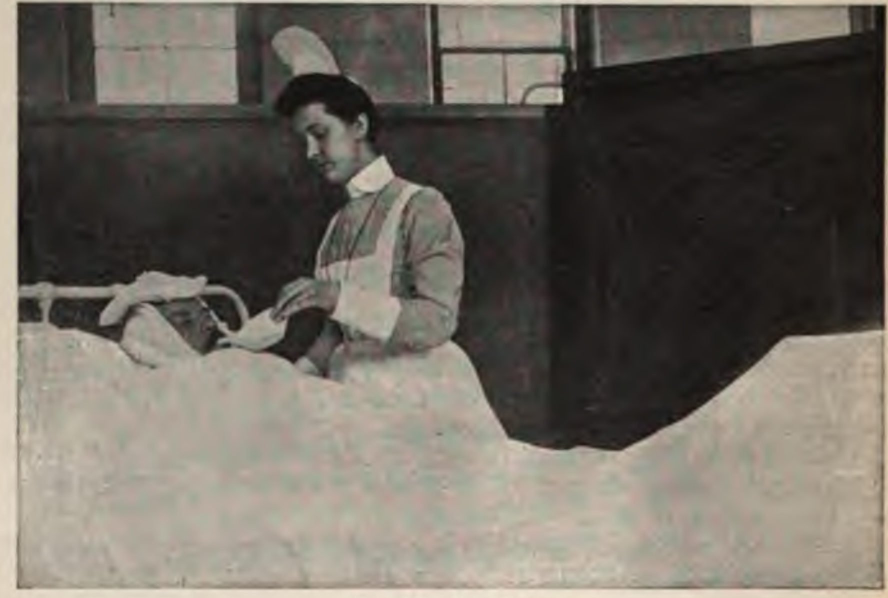

FIG. 23.—HOT PACK.

Hot air and hot vapor baths differ from hot water baths in favoring perspiration. One perspires most in hot air baths.

DOUCHE.—Douche is a term used to indicate a bath where a stream, the size of which may differ, is directed against some part of the body. The force with which it strikes the body acts as a powerful stimulant. It is usually directed against the back, along the spinal column.

TURKISH BATHS are really dry hot air baths combined with a shampoo, massage, and cleansing. The temperature is raised to about 150° F. and sometimes higher.

Russian Baths are exposures of the body to hot aqueous vapor, and the temperature of the room is often raised to 150° F. After the shampoo, massage, etc., the bather is subjected to a very cold douche.

The Permanent Bath, or Hebra's Water Bed, is used for many skin diseases and other conditions. A tub long enough and deep enough to accommodate the prone body is arranged on legs like a bed, and a woven wire support upon which the patient lies is arranged on cogs so that it can be raised or lowered into the tub without disturbing him. A head rest is provided, so that the patient's head may be out of the water. In some cases the patient is left in the water continuously for months. The water should be warm, of about the temperature of the body, and it is changed by means of entrance and exit facilities about three times in twenty-four hours. The water may be medicated. In general it is employed for those conditions where a large surface is denuded of epithelium, as in ulcerative syphilides, psoriasis universalis, pemphigus foliaceus, dermatitis exfoliativa, lichen ruber acuminatus universalis, pityriasis rubra universalis, icthyosis, etc. In burns or injuries from freezing, gangrene, diabetes, endarteritis obliterans, phlegmon, urinary infiltration, decubitus, spondylitis, caries, etc., the permanent bath is of great benefit.

Baths properly applied exert a tonic, eliminative, and antipyretic action.

Mustard Bath.—An ounce of mustard is tied up in a muslin bag and thrown into the bath. The water may be of any temperature desired, 105°, 100°, or 80°.

The Cold Douche is not adapted for feeble cases. It is useful as a heart and nerve tonic. The patient stands in warm water and a pitcher of cold water (60°) is dashed over his back, after which he is rapidly dried and placed on a couch to rest.

The Hot Pack is used in uræmia. The patient is wrapped in a sheet wrung out of water at 110°, and then in a blanket. This may be changed every half hour.

Hot Bath.—The patient is placed in a bath at 100°, with cold applications to the head. It is useful in collapse and to promote elimination by the skin.

Hot Vapor Bath.—Hot air or vapor is introduced under the raised bed clothes from a croup kettle for twenty to thirty minutes.

The Wet Pack (Priesnitz).—The bed is protected by a rubber sheeting, and a large Turkish towel wrung out of cold water is spread out in such a manner that when the patient is laid with his back upon the wet towel and wrapped up in the towel the trunk will be covered and the extremities and head free. The patient is then covered up to the neck with a woolen blanket. The wet pack can be changed every half hour or hour or two hours.

Cool Sponging must be done under cover, or in a room heated to 80°, with alcohol and water or vinegar and water equal parts. Sponge from ten to twenty minutes to reduce the temperature and restlessness. The wet pack and cool sponging are the favorite hydrotherapeutic measures of the author in cases of children.

The Cold Pack is for reducing persistent high temperature with delirium. The patient is enveloped in a sheet wrung out of warm water, and ice is rubbed over the entire covered body, while he lies upon a blanket in a bed protected by a rubber sheet. He may remain in the wet pack and the rubbing with ice be repeated as often as necessary. Hot water bags may be placed at the feet. This is to be employed only in extreme cases for adults and children.

WARM AND COLD BATHS.—The patient is put into a bath at 100° and the water is gradually cooled to 80°, the trunk and extremities being rubbed while he is in the water or stimulated with hot water and whiskey. The bath may last from ten to twenty minutes. To prevent chilling, the tub may be covered with a blanket having a slit for the head to go through. It is for cases with persistent high temperatures with delirium.

THE SHEET BATH.—Where objection is made to the full bath, we make use of the "sheet bath," beginning with a temperature of 100° F. for children or 90° for adults. An old linen sheet or tablecloth should be used, and it should be wrung out very lightly. The patient having been wrapped in this, water at a temperature about ten degrees lower should be poured successively upon different parts of the body, and each part rubbed with the hands until it no longer warms up.

THE ICE CAP AND COLD COIL are often efficacious in reducing temperature and restlessness in infants. They may be used continuously or intermittently, together with irrigation of the colon.

ICE POULTICE.—Cracked ice with bran or sawdust is wrapped in oiled silk or rubber cloth. The indications are the same as for the ice cap.

Cold baths and cold packs should be employed with *great caution and good judgment in infective fevers of children.* Cool sponge baths, with or without alcohol, are stimulating and not depressing, and if supplemented by an ice cap or ice coil and flushing of the colon with cool water, will certainly do no harm. A more decided antipyretic effect is accomplished by tubbing a child at 100° and gradually reducing the temperature of the water to 80° or 70° and applying friction at the same time.

A warm mustard bath at 90° or 100° F. is well borne by feverish children and is an excellent means of starting or favoring elimination. In urgent cases in which a continued high temperature is the grave feature, the prolonged or permanent bath is advisable, starting at 100° and reducing to 80° or 70°, and leaving the patient immersed for twenty to forty minutes. The writer has never seen ill results follow the cool pack by means of a sheet wrung out of cold water and applied all around the body from the armpits to the pelvis under a blanket. The extreme heroic application of cold water, either in the shape of tubbing or the cold pack with ice or snow, is in the author's opinion an unsafe procedure in children and in adults as well.

BALNEOTHERAPEUTICS

The drinking of much water tends to increase the watery secretions of the body, such as the urine, bile, saliva, pancreatic juice, and sweat. It thus aids in the excretion of the waste products. The benefit derived from the courses of mineral waters in a large measure is due to the liberal quantity of water consumed. Gout, urinary gravel, imperfect secretions of bile, constipation, etc., are conditions benefited thereby. (See also chapter on Nutrition and Diet.)

COLD AIR

Inspirations of Cold Air in Fevers.—According to clinical experience, cold air inspirations have a positive value in febrile affections. Patients breathing cold air (adults and children) have a better digestion and sleep better than those in heated rooms. The phenomena of bronchial catarrh decrease to a marked degree under the influence of cold air inspirations, and the general course of disease appears to be favorably influenced.

Antipyresis by drinking large quantities of cold water, in connection with cool water enteroclysis and keeping open the windows of the room day and night, has given excellent results in cases of typhus and typhoid fever. Both these methods of antipyresis increase the quantity of urine and diminish its specific gravity, especially the drinking of water. Thus the internal organs, which have the highest temperature during fever, are cooled, and the tissues are permeated and cleaned by the water and freed of ptomaines.

STIMULATION

When the physician suspects or recognizes circulatory failure, he resorts to methods of stimulation, as with alcohol, drugs, or enteroclysis and baths. When circulatory failure is due to shock or loss of blood (when an individual bleeds into his own blood vessels from vasomotor paralysis), the surgeon relies more upon hypodermoclysis and venous infusion than upon drugs. In the so called weak heart in acute infectious fevers, we have no clear conception of the exact nature of the circulatory failure, and at the bedside we are generally unable to determine whether heart weakness or vasomotor paralysis or both are present, and hence the choice of stimulants in a critical and grave case is not an easy matter. Laboratory experiments on animals poisoned with toxines have demonstrated that circulatory embarrassment, heretofore attributed to cardiac weakness, is due mainly to vasomotor paralysis, particularly in the early stages, whereas the late circulatory failure, in diphtheria for instance, appears to be due to cardiac weakness. In medical practice, and particularly

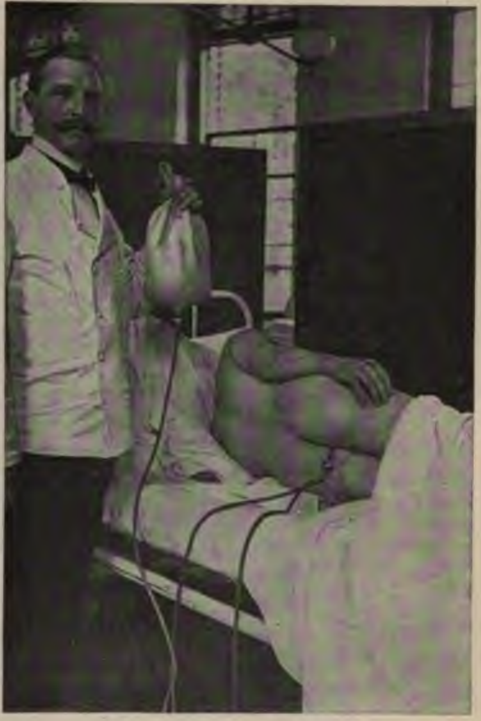

FIG. 24.—ENTEROCLYSIS.

among children, drug stimulation and reflex nerve stimulation by means of cool water are almost exclusively relied upon.

A moderate rise of pulse and temperature appears to be the indication for the administration of the various heart drugs in use at the present time. It is questionable whether early stimulation or promiscuous stimulation is in the interest of the patient. Unfortunately the indications for stimulation are by no means clearly understood, and no doubt in many instances we credit happy results to some particular drug or method when the inherent reserve power of the heart alone is responsible for the recovery of the patient. In view of the many disappointments and failures which we encounter in our attempts to keep the circulation going, there arises this very important question: Is stimulation by means of enteroclysis, hypodermoclysis, and venous infusion as effective and as safe in sepsis as in surgical shock, and in what class of cases may we employ them? The problem will be solved by clinicians at the bed-side.

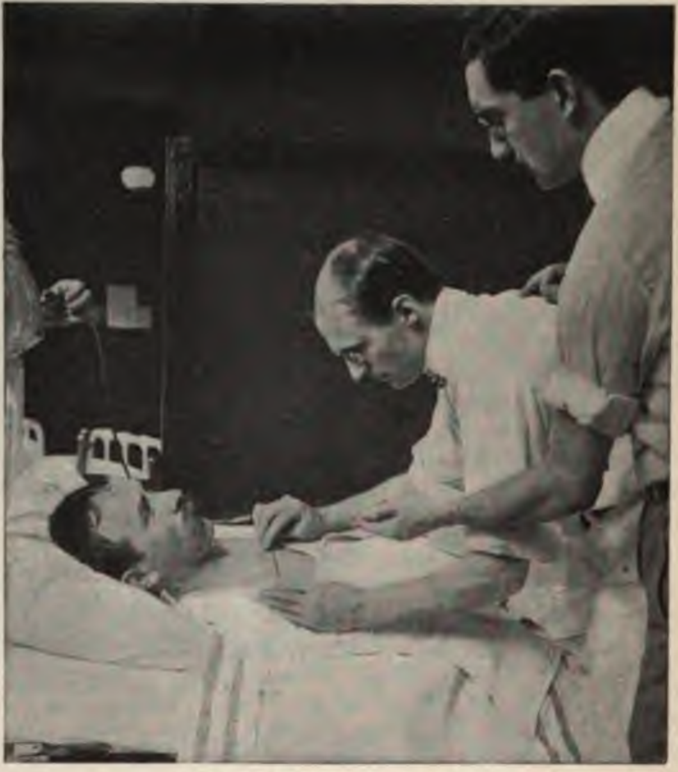

FIG. 25.—HYPODERMOCLYSIS.

In June, 1903, at a meeting of the American Pædiatric Society in Boston, the writer reported some observations bearing on this question from his hospital experience in cases of pneumonic, typhoid, diphtheritic, and puerperal sepsis, of which the following is a résumé.

From the study of the effects of *saline infusion* in shock and hæmorrhage, it would appear that this procedure and also *hypodermoclysis*[1] may be relied upon to promptly and safely stimulate in circulatory failure. And it is safe to continue with the saline until the pulse is of good quality. From a study of the septic cases treated by saline infusion it would appear that in order to remain on safe ground, it should be used for septic cases in which there has been a decided loss of fluids, as in cholera or typhoid diarrhœa. In cases of sepsis without loss of fluids, with an imperceptible pulse and rapid respiration in conjunction with a rapidly thumping and undilated heart, an infusion or hypodermoclysis may be warranted, but under no circumstances should these methods be employed in a routine way.

Enteroclysis.—Enteroclysis, or flushing of the colon with a saline at 110°, is an absolutely safe method of combating circulatory failure in septic conditions. It stimulates kidney secretion and promotes the elimination of poisons. It induces intestinal absorption of water when the body craves it, has a certain effect in reducing temperature, and is indicated as a routine treatment in all septic conditions even if the kidney is not involved. In severe anæmias the writer has found that enteroclysis is followed by an actual improvement of the constitution of the blood independently of the administration of drugs, such as iron or arsenic.

Enteroclysis is performed by means of a long flexible tube and a fountain syringe, or by means of a double current flexible tube (Kemp's method). A tablespoonful of salt is dissolved in two quarts of water at 100° to 110°, and by elevating or lowering the fountain syringe the water is made to flow slowly into the bowel. In order to be effective, this must be kept up from thirty to sixty minutes and carried out by a trained nurse or by the physician himself. Enteroclysis should be universally adopted as a therapeutic measure of great value, and it may be used in connection with drugs, baths, etc.

The advantage of enteroclysis over venous infusion in sepsis lies in its safety. When the heart muscle is weakened by the septic and febrile process, it is dangerous to suddenly increase the blood pressure, and there is also danger of carrying thrombi to other parts. The absorption of fluids from the intestine can only be slow and gradual, and not more can be absorbed than the organism craves.

In general practice enteroclysis is readily possible, and hypodermoclysis or infusion demands a sterile manipulation which is often difficult to obtain. Enteroclysis should be our routine method in typhoid, smallpox, scarlet fever, measles, diphtheria, cholera infantum, eclampsia, and anæmia.

Drug Stimulation

We often administer drugs for the purpose of stimulation, such as alcohol, camphor, strychnine, nitroglycerine, digitalis, and ammonia, and also in connection with the cool douche or cold pack, with a view of effecting a reflex nerve stimulation.

Alcohol.—The conclusion seems to be that, while alcohol cannot build up the body, it does serve as fuel to the body, and at the same time it is capable to a certain degree of stimulating respiration. It is therefore of value in febrile disease and often aids to prolong life.

---

[1] The subcutaneous injection of a decinormal salt solution, ʒvj of sterilized salt to one gallon of sterilized water at 100° to 120° F.

In a general way, we may say that

Whiskey, ... ʒj to ℥viij;
Tokay wine, ... ℥j to 1 pint;
Champagne, ... ℥ij to 1 quart

May be administered in twenty-four hours.

Children take from five drops to a teaspoonful of whiskey in water at a time. Mild stimulants, such as coffee, black tea, and hot beef tea, may be given in connection with or instead of alcohol. Adults may require much larger quantities.

Other drugs used are ether (spir. æther. comp.), gtts. 2 to 20 on sugar; ammonia (spir. ammon. arom.), gtts. 5 to 15 in sugar water; camphor, powder, or oil; digitalis powder, infusion, tincture, fluid extract; strychnine; nitroglycerine; caffeine.

Strychnine, gr. $\frac{1}{50}$–$\frac{1}{30}$; nitroglycerine, gr. $\frac{1}{100}$–$\frac{1}{50}$ every three hours; caffeine and sodium benzoate, gr. iij every three hours; camphor in oil (1–15) is a powerful stimulant and expectorant. Five to ten drops may be injected subcutaneously every three hours.

When the stomach is not rebellious we obtain satisfactory results from

$$\left.\begin{array}{l}\text{Camphor,}\\ \text{Digitalis pulv.,}\\ \text{Acid benzoic,}\end{array}\right\}\text{āā, ... gr. j to iij.}$$

q. 4. h. in sweetmeats or sweet chocolate.

Timely and judicious stimulation is important in the management of disease conditions. Overstimulation is to be avoided, particularly overstimulation by drugs. The reserve power of the heart in children is almost always to be relied upon except in malignant sepsis, and time and again drugs have received the undeserved credit of having sustained the patient in critical times.

Stimulation, alcoholic or non-alcoholic, is contraindicated when the pulse is full and strong, and it may be injurious in such conditions. However, when the pulse becomes weak and compressible, and long before it becomes intermittent, stimulation is necessary.

Apparatus for Infusion and Hypodermoclysis.—A good infusion apparatus should possess the following qualities: It should be cleanly, convenient, easily kept in order, and capable of being immersed in warm water in order to maintain the temperature of the contained infusion fluid as equable as possible. The temperature of the infusion fluid as it reaches the cannula should be known. Finally, the apparatus should be adapted for use in intracellular infusion. In the apparatus herewith figured the bottle is graduated in ounces. Through the rubber cork, which is secured by a simple clamp and screw device, two lengths of glass tubing are placed (A, B), the one reaching to the bottom of the bottle, the other terminating just within the bottle; in the course of the latter a bulb is blown in which a mass of cotton or lamb's wool is placed as an air filter. To the glass tube a rubber bulb is attached. To the long tube a length of rubber tubing is connected, and to the farther extremity is attached a piece of glass tubing in the interior of which a thermometer is placed. Finally, a conveniently curved metal cannula is connected with the latter by a short piece of rubber tubing.

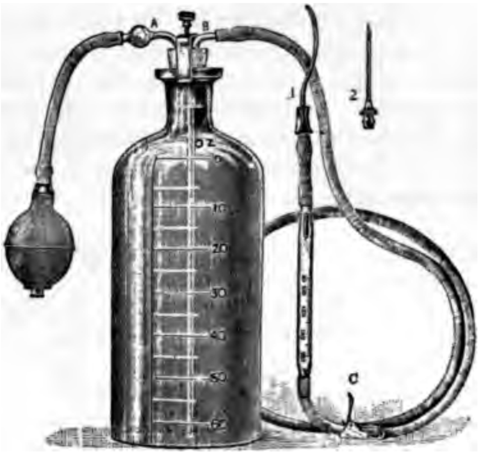

FIG. 26.—APPARATUS FOR VENOUS INFUSION. (Dr. Fowler.)

The manner of emptying the apparatus is as follows: The bottle is filled with decinormal saline solution of the proper temperature. Hot water is added to that in the basin from time to time, as required to maintain the temperature within the bottle. The infusion fluid is forced from the bottle by slow and steady strokes of the bulb, air being driven above the surface of the water, passing through the filter on its way to the bottle. As much or as little pressure as may be desired may be made in this way, this being graduated according to requirements.

GENERAL SYMPTOMATIC MANAGEMENT

DYSPEPTIC SYMPTOMS AND THIRST

Coated Tongue, Nausea, Vomiting, Diarrhœa and Belching of Gas.—In acute and chronic illness digestion is always impaired and dyspeptic symptoms are complained of. After the bowels have been emptied with an enema or laxative drug, feeding the patient should not be pushed much beyond the limits of a natural desire for food. A few drops of dilute hydrochloric acid and frequent small quantities of cooled aerated water or iced black or peppermint tea will usually overcome nausea and vomiting, particularly if the patient remains quiet in bed. In the presence of a coated tongue and foul stomach, it may be wise to get the patient to swallow a pint of warm water and to encourage emesis, and thus empty the stomach. In cases of obstinate vomiting, drop doses of tincture of iodine in sweetened peppermint water may be given every hour, and ice may be applied to the lower part of the spine. The vomiting and diarrhœa of acute gastroenteritis in adults generally subside after a few doses of the following medicine:

℞ Morphin. sulphat., ... gr. ¼;
Tinct. valerianæ athereæ, ... ʒij.

Signa: 5 to 30 drops in cooled carbonated water or on cracked ice every hour until relieved.

Morphine should be given to children only in very exceptional cases. Incessant vomiting is encountered in bowel obstruction, in cerebral cases, in virulent septicæmia from various causes, and in intense intestinal putrefaction from obstinate constipation. Stomach washing with a tube is occasionally necessary to overcome this symptom. Thirst may be relieved by giving cooled carbonated or farinaceous water, or cracked ice and water, and iced tea. In some cases the sipping of warm water, or the sucking of a raw prune, will relieve thirst. To prevent drying of the mouth a moistened piece of plain gauze may be applied over the lips, and the mouth should be frequently rinsed and a few drops of salt water poured into the nostrils occasionally.

LAXATIVES IN ACUTE ILLNESS

It is hardly ever a mistake to begin the treatment of a case of acute illness by first emptying the bowels. This can be accomplished in children and adults by a soap suds enema from 4 oz. to 2 quarts, or by the administration of drugs. Children should have from two to five grains of calomel, to be followed by a saline, or may take a wineglassful of citrate of magnesia or half a teaspoonful of rhubarb and magnesia or maltine with cascara or a tablespoonful of castor oil. Powdered castor oil is now in the market under the name of *Ricinus Siccol.* It is tasteless and contains 50 per cent of oil and may be given in milk without the patient knowing it.

It is a weak preparation at best.

Adults may take Hunyadi, apenta or Rubinat waters, tamar indien, infusion of senna with sodium sulphate,

$$\left.\begin{array}{ll}\text{or Podophyllin, }\ldots\ldots\ldots\ldots & \text{gr. }\frac{1}{4}\text{ to }\frac{1}{2}, \\ \quad\text{Calomel, }\ldots\ldots\ldots\ldots\ldots & \text{gr. 5 to 10,} \\ \quad\text{Pulv. aromat., }\ldots\ldots\ldots & \text{gr. iij,}\end{array}\right\}\text{pro dosi;}$$

or compound licorice powder,.. ʒj to ʒij, pro dosi.

Laxatives for chronic constipation are discussed in the chapter on Constipation.

DIAPHORETICS AND DIURETICS

Diaphoretics.—Elimination by the action of the skin and kidneys is often accomplished by means of so called diaphoretics and diuretics. To induce sweating we employ in adults and children the hot bath, hot pack, and hot drinks, such as peppermint, chamomile, catnip tea, and hot lemonade. The most powerful diaphoretic drug is pilocarpine (jaborandi), which may be given in $\frac{1}{12}$ to $\frac{1}{8}$ grain doses to children and adults every two to three hours until the desired effect is produced. The dose of infusion of jaborandi is 2 to 3 drachms. Owing to its heart depressing effects, it is not an absolutely safe drug in septic fevers with a dry skin, and it is therefore not employed to any great extent by careful physicians who are anxious not to do harm. In collapse from pilocarpine there is usually a cold perspiration, with a fine rapid and intermittent pulse, and in extreme cases profuse salivation and pulmonary œdema. It may be well to remember that pilocarpine and atropine are antagonistic. When the stomach is not rebellious, the following diaphoretic powder may be taken with a hot drink at bedtime:

℞ Pulv. doveri, ... gr. 5–10;
Camphoræ, ... gr. $\frac{1}{2}$–1;
Pulv. chocolad., ... gr. 20.
M. sig., one dose.

Diuretics and their Doses.—Drugs which increase arterial pressure or salts which are readily diffusible and combine with water are useful as diuretics. The following drugs may be used singly or in combination:

Infusion of digitalis, in ʒj doses for children; in ʒiv doses for adults, about every three hours.

Tincture of digitalis, gtts. 5 to 30, four times a day.

Fluid extract of digitalis, gtts. 1 to 5, also subcutaneously, in urgent cases. Watch for a cumulative effect and the digitalis pulse.

Tincture of Strophanthus.—Rapid action; no cumulative effect; dose, gtts. 5, four times a day. Also in tablet form as *strophanthin*; dose, $\frac{1}{200}$ to $\frac{1}{350}$ gr.

Squill.—Fluid extract; dose, gtt. 1 to 3.

Caffeine, Sodium Benzoate.—Readily soluble in water; dose, gr. 1 to 5 for adults, gr. 1 to 2 for children. Also subcutaneously.

Theobromine Sodium Salicylate (*Diuretin*).—Readily soluble in water. Should be employed when digitalis and caffeine are used without success. The dose is gr. x to xv four to six times a day. The diuretic action should be noticeable within one to three days.

Camphor.—Gr. 1 to 3 for adults; $\frac{1}{2}$ to 1 for children, with sugar or chocolate. In oil (1 to 15), subcutaneously. Also in combination with digitalis and benzoic acid.

Calomel or Blue Mass.—Gr. 5 to 10, twice a day for two days. May be given in combination with jalap.

Acetate of Potassium.—Soluble in water. Dose, 10 to 60 gr. three times a day. When diuresis is to be stimulated, it is often a good plan to begin with calomel or blue mass and follow up its effects by the administration of other diuretics of the foregoing list, together with hot drinks. When patients do not urinate, we must not fail to examine the bladder for a possible *retention of urine.*

EXPECTORANTS AND COUGH MIXTURES

A cough is an expulsive effort at expectoration, and unless extremely harassing should not occasion alarm. When a cough takes its origin in the nasopharynx, the nasopharyngeal toilet (salt water and albolene spray) is indicated, or local cauterization with a 2 per cent solution of nitrate of silver. To allay reflex irritability and check cough, opium and its preparations may be given, with or without expectorants. Expectorants are occasionally necessary to aid nature in expelling secretions, particularly in feeble children and very old people.

Ipecac, ammonia, benzoic acid, camphor, and iodide of potassium are examples of expectorants. Free expectoration is more readily obtained when the patient receives plenty of water.

The writer makes use of the following formulæ in his practice:

℞ Tinct. opii camphoratæ,	ʒij.

Signa: 5 to 15 drops in sugar water once or twice at night to check cough in a child.

℞ Tinct. opii camphoratæ,	āā,	ʒij.
Vini. ipecacuanhæ,		

Dose, 10 to 15 drops. Sedative and expectorant for a child.

℞ Liq. ammon. anisati.,	ʒij.

One-half to 5 drops in sugar water several times a day for children and adults. Expectorant.

℞ Ammon. chlorid.,		ʒj;
Morphin. hydrochloride,		gr. ½;
Aquæ,	āā,	℥j.
Syrupi pruni virginian,		

Dose, a teaspoonful every three hours for adults, to check cough.

℞ Potassii iodidi,	ʒij;
Tinct. opii camphorat.,	ʒij;
Liq. ammon. anisat.,	ʒss.;
Syrupi Tolutani,	ʒij;
Aquæ, ad.,	℥jv.

Dose, ½ teaspoonful to one tablespoonful three to four times a day. An expectorant for children and adults.[1]

Sedatives for adults.

℞ Codeine,	gr. ¼ to gr. ij,	pro dosi.
Morphine,	gr. ⅙ to gr. ½,	
Heroin,	gr. 1/16,	

May be given in powder or tablet form in solution with syrup of Tolu or mucilage, or subcutaneously.

℞ Camphoræ tritæ,	gr. j,	pro dosi.
Acid. benzoic,	gr. iij,	
Extracti hyoscyami,	gr. ½,	

In water or capsule or in powder form, to be taken in sweetmeats three times a day as an expectorant for adults.

Terebene and *terebene hydrate* may be taken internally for any form of chronic bronchitis. As an expectorant the dose is from 4 to 20 drops in syrup or on sugar, also in combination with heroin, and it may be administered by inhalation in all throat affections (2 oz. in a week). Sedative and expectorant *troches* are sold in the shops ready made. They are useful in slight ailments. Black Forest pine needle troches, Ems pastilles, and red gum lozenges are useful to allay cough.

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[1] *Ether* is a powerful expectorant in subacute and chronic bronchitis. Adults may take 5 to 10 drops on sugar several times a day. Children may take 1 to 2 drops.

INHALATIONS

The various saline antiseptic and balsamic inhalants in the shape of vapors and sprays are of little value as compared with the soothing effects of breathing and living in the pure, fresh, dust free air of the mountains or the seashore. Inhalation therapy is quite popular among the laity and is a routine method of treatment in sanatoria.[1] In private practice, in cases in which a moist atmosphere would favor expectoration, the humidity of the air of the sick room may be increased by evaporating water from an open vessel or croup kettle over a flame, and to the water may be added oil of turpentine, oil of eucalyptus, compound tincture of benzoin, terebene, creosote, etc.

The upper respiratory tract may be lubricated by means of an inexpensive hand atomizer containing benzoinated albolene, etc.

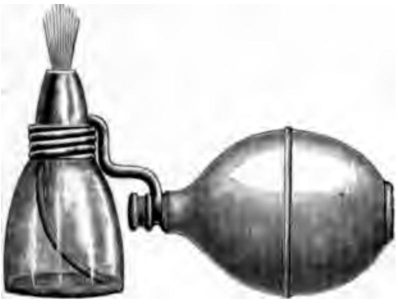

Fig. 27.—Atomizer for Albolene.

Adults may directly inhale hot medicated moist air by sprinkling the substance to be inhaled upon several layers of flannel wrung out of hot water and held directly over the face. Oxygen inhalations are employed in a routine manner—the author has never observed any marked beneficial effects from oxygen inhalations in hospital or private practice. Inhalations of ozone, iodide of ethyl, amyl nitrite, and chloroform are occasionally employed on special indications—also the vapors of stramonium and nitre and in the form of cigarettes.

DYSPNŒA

This is a very distressing symptom, and a careful study and determination of its immediate and remote causes will aid in suggesting the means of affording relief. An embarrassed heart or lung may require venesection or drug stimulation; general œdema, ascites, or hydrothorax may necessitate in addition scarification and puncture and subsequently morphine or chloral at night to secure rest. A dyspeptic and neurotic dyspnœa will often pass off after we have given the patient 10 to 20 drops of compound spirit of ether on sugar. The dyspnœa of arteriosclerosis and Bright's disease usually demands morphine subcutaneously administered.[2] Dyspnœic patients breathe easier in an upright position; thus in severe cases the patient may sleep in a Morris chair or in bed in an upright and forward posture, the arms and head resting on a benchlike support.

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[1] From experiments made to show the behavior of atomized fluids in the respiratory tract it has been shown that a considerable portion of the inhaled cloud condenses on the posterior pharyngeal wall, and that the quantities reaching the deeper parts are too minute to have any therapeutic value.

[2] Neurosis of the phrenic nerve with diaphragmatic inactivity or spasm has been observed as a cause of dyspnœa.

PAIN IN ACUTE AND CHRONIC ILLNESS

Pain, if severe, should be relieved; sometimes change of position or the application of a cold compress or hot water bag or mustard plaster will relieve pain. Pain, if localized and severe, is best overcome by means of a hypodermic injection of morphine, gr. $\frac{1}{8}$ to $\frac{1}{2}$, as in rheumatic arthritis or intestinal or biliary colic, or after injury. Pelvic and rectal pain may often be relieved by a suppository of

℞ Extr. opii, }
Extr. belladonnæ, } āā, ... gr. $\frac{1}{2}$;
Butyr. cacao, ... gr. 10;

to be applied per rectum or vaginam. In severe enterocolitis in children a suppository of these drugs in $\frac{1}{10}$ of the dose mentioned is often of great value.

Neuralgic pain may necessitate a hypodermic injection directly over the seat of the pain. Frequently a dose of bromide of potassium or chloral hydrate, by inducing a restful sleep, will overcome pain. Neurotic individuals should not be encouraged in the use of opium and anodynes for moderate pain.

NERVOUSNESS AND INSOMNIA IN THE ABSENCE OF PAIN

These are very distressing symptoms. A warm bath, a cooling sponge bath, an ice cap, and, in adults and older children, the quiet assurance that all will be well, may quiet a patient. The following drugs are occasionally of great service: *Codeine*, by the *mouth*, gr. $\frac{1}{2}$ to ij for adults, $\frac{1}{20}$ to $\frac{1}{10}$ for children.

℞ Codein., ... gr. j to ij, }
Urethane, ... gr. 30, } pro dosi.

To be taken at bedtime (for adults).

℞ Hydrate of chloral, }
Potass. bromide, } āā, ... gr. 15 to 30.

Dose for an adult.

Or hydrate of chloral and potass. bromide, āā, gr. 1 to 2, for a child, in sweetened water or per rectum.

Or trional or sulphonal in 15 gr. doses in milk, for adults.

In cerebral unrest hyoscine (Merck) is indicated. Dose for the insane, gr. $\frac{1}{32}$; for the sane, gr. $\frac{1}{100}$ (may be repeated). In insomnia with pain or severe dyspnœa a hypodermic injection of morphine is often necessary. If the insomnia and dyspnœa are due to massive pleuritic effusion or ascites, the liquid must be removed; if to pulmonary congestion, a venesection should be done. The writer has been disappointed in lactucarium and hasheesh as dispensed in our country. Beer or porter at bedtime may induce a quiet sleep.

Counterirritants and indifferent external applications have no scientific or precise indication. The writer makes use of the ice bag, hot water bag, and cold wet compress. The latter should be used in connection with rubber sheeting or oiled silk, to prevent general wetting of the bed. Poultices may be discarded as offering no advantage over the bag, and the physician need not support superstitious ideas by speaking of pneumonia jackets, etc.

As counterirritants, *dry cupping, mustard baths, mustard plasters, cantharides plasters,* and *iodine* preparations are useful. Soothing external applications and percutaneous therapeutics are discussed in the dermatological memoranda and other special chapters in this book.

VENESECTION AND LOCAL DEPLETION

In cardiac and respiratory embarrassment, when compression of the arm below the shoulder produces marked distention of the veins below (forearm and elbow), and when heart drugs fail to stimulate the lagging heart muscle, the unloading of the heart or embarrassed circulation by venesection is indicated. Six to fifteen ounces of blood may be withdrawn.

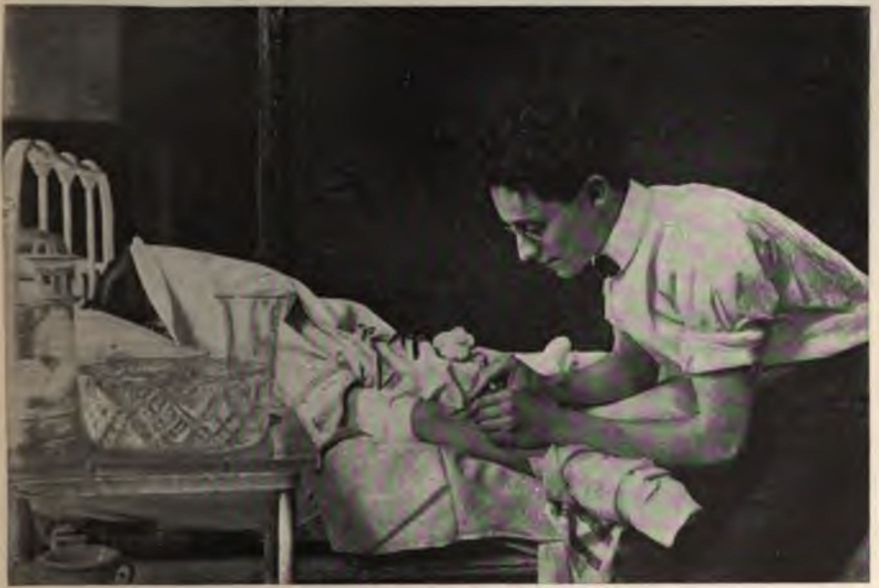


FIG. 28.—TECHNIQUE OF VENESECTION.

Local depletion by means of *scarification* and *puncture, wet cupping,* or *leeching* is performed in ophthalmic and aural practice for the relief of local hyperæmia or congestion. Leeches will readily attach themselves if the parts are washed in ice cold water and then slightly scarified as for vaccination. After the leech drops off, the bleeding point will continue to bleed if hot cloths are applied. In case of too profuse hæmorrhage, ice cloths and compression may be used. Scarification is sometimes employed in lymphangeitis and erysipelas, followed by a wet antiseptic dressing.

Venesection in Children.—This may be indicated in respiratory failure and for the purpose of relieving an embarrassed heart in

Bronchitis,	Cyanosis and Dyspnœa.
Pneumonia,	
Cardiac lesions,	
Convulsions due to congestion of brain and in uræmic conditions,	

From one to three ounces of blood may be removed. Venesection in children is not often practised.

The Technique of Venesection.—The arm is constricted between the shoulder and elbow by means of a silk handkerchief. The region of the bulging median vein is cleansed and made anæsthetic by injecting a 2 per cent cocaine or stovaine solution. After incising the skin the vein is punctured. A firm bichloride compress will stop the bleeding.

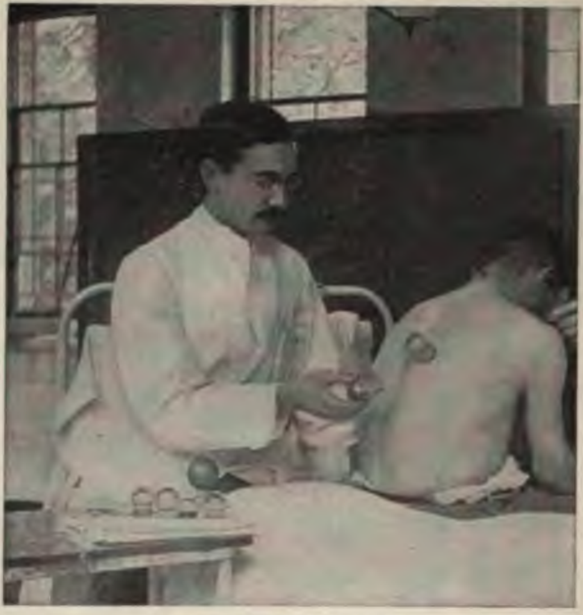


FIG. 29.—DRY CUPPING.

THE NASOPHARYNGEAL TOILET

The nasopharyngeal toilet, as advised by the author in all febrile diseases, consists in the instillation into each nostril, by means of an ordinary teaspoon, of a spoonful of weak salt water morning and evening (at bedtime and on rising) as the children lie on their backs with the nose tilted up and the mouth open. The liquid does not wash through at once; some of it remains in the various recesses of the nasal cavity and is eventually sneezed out or swallowed. In this way putrescible matter and bacteria are washed away.

This form of mechanical antisepsis is indicated as follows: It is the best method of local treatment of all cases of diphtheria, in which instances it should be resorted to every two hours; moreover, it is the most satisfactory local routine treatment in all diseases in which diphtheria frequently sets in as a complication, e. g., in measles, scarlatina, and pertussis; furthermore, it is a necessity before and after amygdalotomy and all operations on the nose and throat. This method is far superior to gargling, and the writer, after an experience of more than fifteen years with this method, again takes pleasure in recommending it on account of its great value and harmlessness. In many forms of reflex cough, also in pneumonia and tuberculosis, it is far superior to nauseating expectorant mixtures, and in all forms of febrile disease in which the nasal secretion becomes dry, crusty, or hardened, half a teaspoonful of salt water instilled into each nostril affords much relief. The nasopharyngeal toilet not only does not provoke middle ear and sinus complications, but apparently prevents them. If chemical antisepsis is in addition urgently demanded, as in malignant sore

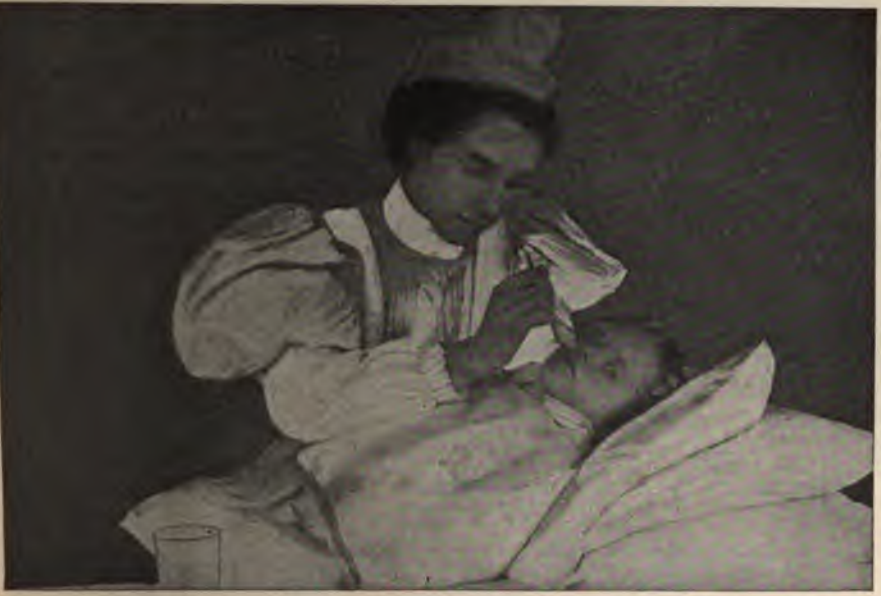


FIG. 30.—NASOPHARYNGEAL TOILET (Author's Method).

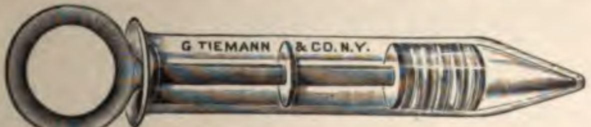


FIG. 31.—BLUNT NASAL IRRIGATION SYRINGE.

throat, we may employ a 5 per cent solution of ichthyol in water or a bichloride of mercury spray, 1–10,000. The surface of the nose may be covered with vaseline, and an albolene spray may be used to advantage in some cases when the watery fluid is not soothing enough. See also article on Diphtheria in Pædiatric Section.

TONICS IN THE CONVALESCENT STAGE

The best general tonic after acute illness is probably a change of air, from the city to the country, from the mountains to the seashore, and vice versa. A regulated digestion and exercise, massage, baths, and restful surroundings are welcome to every convalescent. The administration of dilute hydrochloric acid after meals will aid digestion, and a normal digestion and good food will soon bring the blood composition up to the proper standard.

Hydrochloric Acid.—

℞ Acidi hydrochlor. dil., ... ʒjv.

Five to ten drops in sugar water after eating.

℞ Acidi hydrochlor. dil., }
Tinct. nucis vomic., } āā, ... ʒij.

Five to ten drops in sugar water after eating.

℞ Acidi hydrochlor. dil., ... ʒj;
Ess. pepsini, ... ℥ij.

A teaspoonful in water after eating.

℞ Acidi hydrochlor. dil., }
Tinct. gentian. comp., }
Tinct. rhei vinos., }
Tinct. cinchonæ composit., } āā, ... ʒjv.

Half a teaspoonful in water after eating.

℞ Acidi hydrochlor. dil., }
Tinct. quassiæ, } āā, ... ʒj;
Ess. pepsini, ... q. s. ad., ℥iij.

A teaspoonful in water after eating.

℞ Acidi hydrochlor. dil., ... ʒj;
Bismuthi subnit., ... ʒj;
Ess. pepsini, ... ℥jv.

A teaspoonful in water after eating. Shake well.

If *iron*, *arsenic*, *phosphorus*, and other drug tonics are to be given, the tongue must first be clean, and should a clean tongue become coated after the administration of drug tonics, the latter should be discontinued and hydrochloric acid substituted. The author uses the following formulæ in his practice for anæmic convalescents:

Tinct. ferri. chlorid., in doses of 2 to 20 drops three times a day.
Tinct. ferri. pomati, 5 to 20 drops three times a day.

℞ Elixir gentianæ comp., ... ℥ij;
Tinct. ferri. chlorid., ... ʒj.

Dose, ½ to 1 teaspoonful three times a day.

Liquor Peptomangan.—Dose, 5 to 15 drops three times a day.

Liq. Bromo Mangan.—Dose, ʒ½ to ʒj.

Elixir Calisayæ Cum Ferro et Strych.—Dose, ʒj to ʒjv several times a day.

Also the *glycerophosphates* and *hypophosphites of iron and iron tropon.*

Arsenic is best administered in the shape of Fowler's solution, 1 to 5 drops in water three times a day after eating.

Phosphorus in the shape of Thompson's solution may be given to children in 10 to 20 drop doses three times a day in water. Elixir of phosphorus is a palatable preparation. Phosphorus chocolate lozenges may be given to children as candy. Adults take larger quantities.

A very good alcoholic malt tonic for convalescents is barley wine, and several of the large brewing companies of our country make a palatable malt beverage containing little or no alcohol.

Malt and maltine preparations are beneficial for convalescents.

MENTAL THERAPEUTICS AND WORK FOR THE SICK

The influence which may be exerted on the minds of the patients is of the utmost importance in acute as well as in chronic ailments. Abnormal mental conditions lead to an exaggeration of symptoms, to imaginary ailments, and to undue apprehension, which interfere (by a general depressing effect upon bodily functions) with the favorable progress of disease. Determination and a strong will are efficacious in resisting and overcoming disease. Lives are made miserable by injudicious injunctions to rest from work or by failing to suggest some congenial work. Old people who are apt to become introspective and a burden to themselves are often made happier if they go back to nature and spend their declining years in the country, where they can always find some form of pleasant occupation during the day and rest and quiet surroundings at night. In chronic ailments the tactful physician will hold out to the patient the encouraging features of a case, and not "imitate a judicial sentence of death" by telling the patient that he is in no immediate danger and that he may live for several weeks or months. A hopeful attitude toward the patient is always correct and ethical. It prolongs life and alleviates suffering.

In conclusion, I wish to emphasize that the important points in the management of acute febrile disease are *diet, hydrotherapy, rational stimulation, and free breathing of pure cool air*. Drugs no longer dominate our therapeutics. After the bowels have been made to move, drugs are not indicated, unless for some special and substantial reason. The more intelligent part of the community have lost faith in drugging, and medical men should not continue to countenance or encourage superstition as to drugs. When a placebo seems indicated, a few drops of hydrochloric acid in sugar water or in essence of pepsin are rational and will do no harm. Infants do not require a placebo, and young and inexperienced mothers should be gently but firmly enlightened on such matters. Drugs may be administered by the stomach, by the rectum, by inunction, or by hypodermic injection, with reference to the local or general therapeutic activity sought.

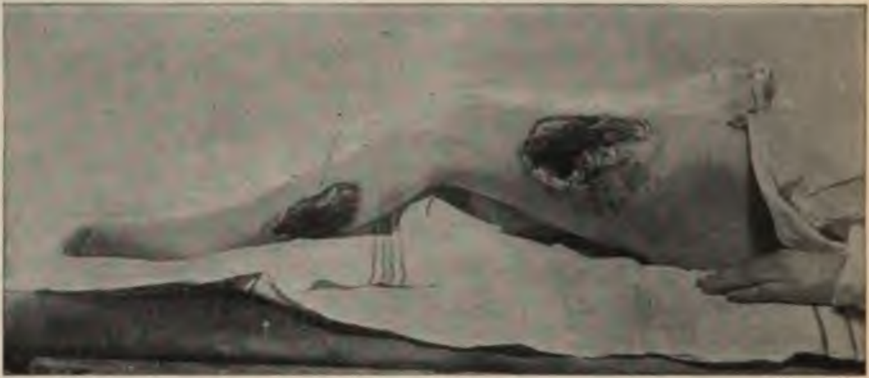


FIG. 32.—INFECTION AND SLOUGHING OF THE SKIN FROM UNCLEAN HYPODERMATIC INJECTIONS.

Dose Determination.—Regarding dose determination, it is well to remember the $\frac{1}{20}$ rule advanced by Dr. V. C. Pedersen, of New York: A full therapeutic dose will be tolerated by a subject twenty years of age and upwards; the proportionate dose for any age, twenty years or less, is found

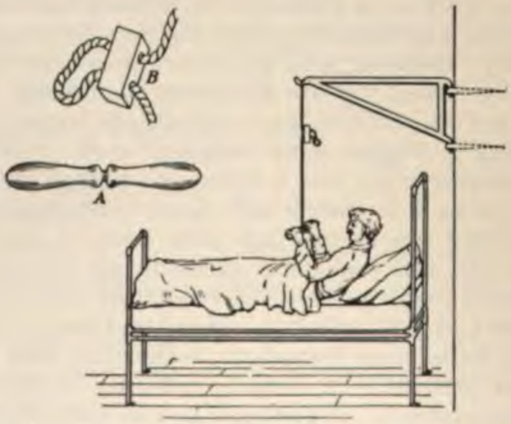


FIG. 33.—BED GRAPPLE FOR THE COMFORT OF PATIENTS.
(From the Medical Council, 1904.)

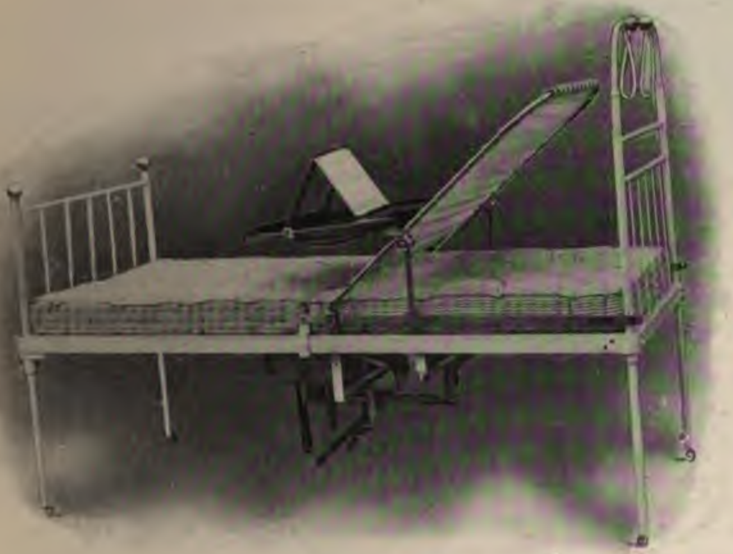


Fig. 34.—Feely Invalid Bed.

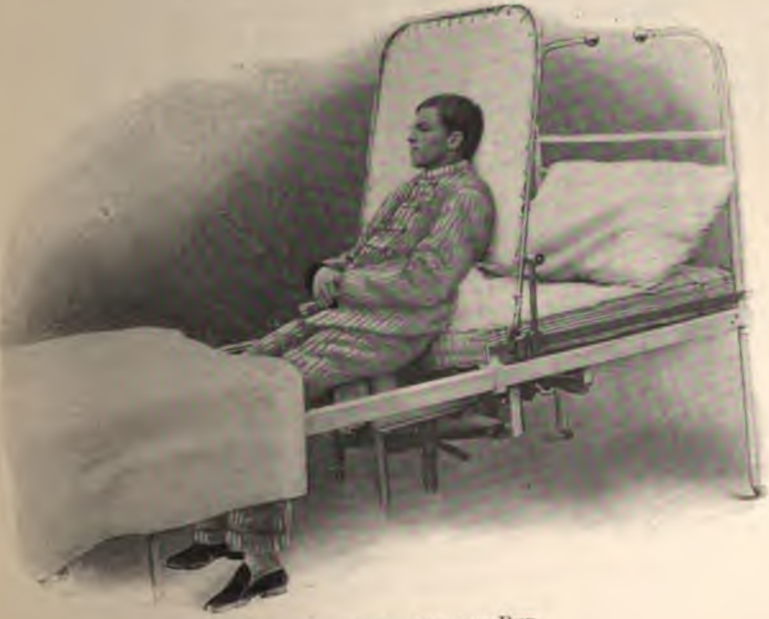


Fig. 35.—Feely Invalid Bed.

by taking $\frac{1}{20}$ of the full dose and multiplying the result by the age in years or fractions of years.

The Metric System in Prescription Writing has made but little progress in the United States.

To facilitate the conversion of apothecary's weights and measures into the metric system the following tables and rules are not too cumbersome and tedious for practical use:

To convert ounces into grammes, multiply by 30.

To convert grammes into ounces, divide by 30.

To convert troy grains into centigrammes, multiply by 6.

To convert centigrammes into troy grains, divide by 6.

To convert troy grains into milligrammes, multiply by 60.

To convert milligrammes into troy grains, divide by 60.

To convert troy grains into grammes, or minims into fluid grammes, divide by 15.

To convert grammes into grains, or fluid grammes into minims, multiply by 15.

To convert drachms into grammes, or fluid drachms into fluid grammes, multiply by 4.

To convert grammes into drachms, or fluid grammes into fluid drachms, divide by 4.

PRACTICAL APPROXIMATE GRAMME VALUES

Grains	Grammes	Grains	Grammes	Grains	Grammes	Grains	Grammes
	0.004	4	0.26	20 (℈j)	1.3	100	6.6
$\frac{1}{12}$	0.005	5	0.30	24	1.5		
$\frac{1}{10}$	0.006			30 (ʒ ss)	2.0	120	8.0
$\frac{1}{8}$	0.008					150	10.0
$\frac{1}{6}$	0.010	8	0.52	36	2.3	180	12.0
$\frac{1}{4}$	0.015			40 (℈ij)	2.6	240	16.0
$\frac{1}{3}$	0.02	10	0.60			300	20.0
$\frac{1}{2}$	0.03					360	24.0
$\frac{3}{4}$	0.05			60 (ʒ j)	4.0	420	27.0
1	0.06	15	1.00			480	30.0
2	0.12					℥ ij	60.0
3	0.20	18	1.20	90	6.0	℥ iv	120.0

Invalid Bed.—In severe or protracted illness a properly constructed invalid bed or bed grapple is a great convenience for patient and nurse. (See Illustrations.)

CHAPTER III

PÆDIATRICS

SYNOPSIS: Care of the New-Born.—Diseases of the New-Born.—Deformities.—Malformations.—Infant Feeding.—Facts about Milk.—Maternal Nursing.—Cow's Milk for Infant Feeding.—Diet for Children after Weaning.—Ailments of the Mouth in Infants and Children.—Mumps.—Indigestion and Diarrhœal Disorders.—Malnutrition.—Rickets.—Marasmus.—Scurvy.—Worms in Children.—Tuberculous Peritonitis in Children.—Diseases of the Respiratory Tract in Children.—Colds, Bronchitis, Pneumonia, Pleurisy, Empyema, Whooping Cough.—Pyothorax.—Thymus Gland.—Bronchial Lymph Nodes.—The Nasopharynx.—Diphtheria and Croup.—Intubation and Tracheotomy.—The Nasopharyngeal Toilet.—Tonsillitis.—Peritonsillitis.—Quinsy.—Enlarged Tonsils.—Adenoid Growths.—Retropharyngeal Lymphadenitis and Abscess.—Eruptive and Other Fevers in Children.—Measles, Rubeola, Scarlet Fever, Malaria, Typhoid Fever.—Glandular Fever.—Vulvovaginitis and Masturbation.—Familiar Forms of Nervous Derangements Peculiar to Early Life.

INTRODUCTORY REMARKS

IN this section the author presents in a clinical garb the diseases which are peculiar to early life or show marked peculiarities in infancy or childhood. In order to avoid unnecessary repetition, no attempt has been made to enumerate and discuss all diseases occurring in children, and when an apparent omission is noticed, particularly as regards skin lesions, urogenital and circulatory disturbances, etc., which present no *marked* difference in childhood, the reader will find the matter discussed elsewhere.

CARE OF THE NEW-BORN

The Cord.—Express the excess of gelatine from the cord, dust with subnitrate of bismuth, and wrap in aseptic gauze or absorbent cotton, after which the flannel binder around the abdomen may be applied. The dressing is not to be unnecessarily disturbed, and may be removed at the time the cord separates from the body, about the fifth or seventh day. The stump may then be dusted with mild aseptic powder and a small pad placed *in situ*. The cord stump is practically healed about the tenth day.

Asphyxia.—This condition when present will call for prompt relief. The infant is cyanotic, livid, or frequently, when the asphyxia is deep, the child presents a pale, deathlike appearance. This condition is due to many and various causes, prominent among which are inherent weakness of the child, pressure of the cord about the neck, prolonged labor, undue pressure exerted on the head by forceps, aspiration of mucus, blood, or amniotic fluid, or illness of the mother (convulsions during labor, anæsthesia, etc.). In attempting to reestablish the respiration, there are many methods of resort. First, clear the mouth and pharynx with a swab of cotton to disengage accumulated mucus. If mucus or fluid obstructs the trachea, aspiration by the rubber catheter is indicated. Applications of alternate hot and cold water and spanking are mechanical means of favoring better respiratory efforts and assisting the flagging circulation. Mouth to mouth inflation, with the infant's head thrown back, may be tried. Sylvester's and Schultze's methods of inducing artificial respiration are commendable, also, rhythmical traction of the tongue. After the reestablishment of respiration, the infant should be observed for some hours, and one or more of the combined methods above indicated resorted to in instances demanding repetition. Asphyxia may result in cerebral congestion, effusion, thrombosis, extravasation, and destruction of nerve tissue with secondary inflammation and cystic degeneration. Prolonged asphyxia of the new-born may result in idiocy; about 40 per cent of the idiots who were first born children have a history of asphyxia. The longer the duration of asphyxia, the greater the danger. The immediate treatment of asphyxia is therefore very important.

Mouth.—The maintenance of cleanliness of the mouth is important. It may be wiped out with soft lint or cotton moistened with 2 per cent boric acid solution, but we must avoid washing out the mouth directly after a nursing, to prevent vomiting of recently ingested milk. The mouth of infants is exquisitely tender, and cleansing with the finger, unless carefully done, is apt to injure the epithelial surface and result in ulceration. The same injury occasionally results from the pressure of too large a rubber nipple. Ulcerative stomatitis in the new-born is observed over the hamular process of the sphenoid, and is due to irritation in cleansing the mouth or may be due to the irritation of epithelial pearls in the roof of the mouth. It shows as a superficial ulcer, covered with a yellow film and bounded by a red line, and may occupy the larger part of the soft palate. Such a child appears in good health and has no fever. The epithelial pearls are a physiological formation and require no treatment, as they disappear in time. The stomatitis yields to the usual local antiseptic treatment.

The Eyes.—Avoid the use of a sponge to the eyes. Fresh tufts of absorbent cotton are cleanlier and less irritating. To prevent the occurrence of ophthalmia neonatorum, instil a ½ to 2 per cent nitrate of silver solution into the eye and neutralize after a few minutes with mild sodium chloride solution (table salt).

The Temperature at birth is about 100° F. This soon falls, and varies from a fraction to a degree under the action of the bath, clothing, and skin radiation. The average rectal temperature of the healthy infant is about 99°.

Respiration in infants is diaphragmatic, and the rhythm is easily disturbed. At birth we observe 35 to 40 respirations a minute.

Pulse.—At birth it is quite rapid, more so in the female than in the male infant. In infancy, too, the slightest disturbance in activity from rest to motion profoundly influences the pulse rate and its force. The average frequency of the pulse is about 120 to 150.

Weight.—At birth it varies, the average weight being about seven pounds. During the first few days after birth there is a slight loss in weight and then a gain of about half an ounce daily. The average gain in weight for the first two years is about 20 pounds, in length about 10 inches.

The Stools.—The color of the first stool (meconium) is black. Normal stools are yellow and like mush. Curdy and green stools and loose watery stools indicate some form of indigestion.

Clothing.—The clothing should be of such texture and structure as to insure everything that the terms comfort and hygiene comprehend. Avoid the use of tight and constricting bands at the waist. The flannel band should be about four inches wide, without hem, and applied smoothly twice around the body. For diapers soft cotton napkins one yard by one half yard, folded once, are suitable. Rubber outer diapers have their advantages for purposes of cleanliness, but should be worn only on occasions of outing, when the conditions are such that fresh diapers cannot be applied.

The stockings should be secured to the diapers. The outer garments of the infant should not be too long and they should open in front.

The Nursery.—Children will not thrive unless they have sunlight and unless they sleep in a well ventilated room. During the day the room should have a temperature of 68° to 70° F., at night 60°. Under no circumstances is a gas stove or oil stove to be used to heat a room unless it is connected with a flue so that the products of combustion may escape. The amount of air space necessary for a child is from 800 to 1,000 cubic feet, with proper facilities for ventilation. The child, after three weeks have elapsed, is to be taken out of doors daily in clement weather, to enjoy the beneficial effects that sunlight and fresh air conduce to. At the sixth month the baby is to be vaccinated. Babies attempt to sit up about the sixteenth week and try to stand about the ninth or tenth month. The first milk teeth come about the seventh month, and the permanent teeth about the seventh year.

NURSERY REQUISITES.—Bath tub; rice powder and pepper box; wash cloths (no sponges); alcohol lamp for warming purposes; hot water bag; fountain or piston syringe with soft rectal tube; absorbent cotton for the eyes; fennel tea; white vaseline.

Bathing Infants.—A daily bath should be given at about 95° to 99° F. in a warm room. As children grow to one year, the bath water may have a temperature of 90°—for older children 70°. During warm weather one bath night and morning is necessary, or one warm bath and a cool sponge. The bath should be of short duration, followed by mild friction when the child is out of the water.

POINTS TO BE OBSERVED BY NURSES

Regular Habits must be established by feeding at regular intervals and by putting the child to sleep at the same time of the day or evening.

Wakefulness is principally caused by overfeeding, night-feeding, thirst, or constipation.

Napkins, not properly washed and dried, will hold urinary salts and produce excoriations. *In handling a baby* the head and neck must be supported, and *in feeding a child from the bottle* an overflow of milk must be avoided by feeding in a semirecumbent posture and by careful watching.

Salt water (a teaspoonful to a pint) is useful for the purpose of keeping the nose clean and moist. A few drops may be put into each nostril by means of a blunt spoon.

Premature Infants.—PROGNOSIS: Few infants born before the twenty-ninth week are saved. Continued loss of weight is discouraging, and the sooner a steady gain in weight is recorded the better.

TREATMENT.—Premature children require great care and attention, and if too feeble to take the breast can receive the mother's milk removed with the breast pump from a spoon, or pipette, or by means of the breast bottle. Regular and proper feeding, preservation of the bodily heat, and great attention to cleanliness must be observed. Simple prematurity is oftentimes accentuated by constitutional debility of the child, owing to cachexia of the mother from tuberculosis, syphilis, carcinoma, malaria, Bright's disease, and other acute diseases, such as typhoid fever and pneumonia, or persistent vomiting. If premature children are to thrive in an incubator, this apparatus must be connected with the outer or fresh air; and they must have incessant care and attention. According to the writer's experience premature infants can be raised and do better without an incubator, if kept in a room at about 80° F., their heat sustained by wrapping in cotton batting.

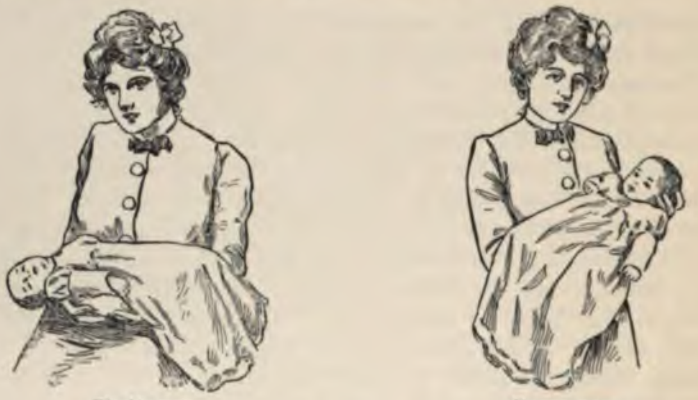

Faulty way. Correct way.

FIG. 36.—HOW TO HOLD THE BABY.
(From Health Culture.)

In cases of prematurity, the mother's milk is inferior to the milk of a wet-nurse, whose infant must be healthy, full term, two weeks of age. Premature infants if deprived of the breast are fed on low strength top milk (¼) by means of a medicine dropper. They take from ʒj to ℥j about every two hours and should be fed slowly (see also infant feeding).

The mother's breasts in the mean time should be pumped and massaged so that they will not dry up. The feeding is accomplished by means of a pipette. Asses' milk has been successfully tried in feeding premature infants.

When there is an *attack of cyanosis* in a premature infant, the child should be inverted in order to clear the trachea; and a few drops of diluted whiskey may be given. Attacks of cyanosis are not necessarily fatal. The bowels should be made to move. Some hardy individuals can be raised artificially altogether. Infants of three and a half to four pounds can be saved at six and a half to seven months. A seven months' infant would require one half ounce of modified milk every hour and a half.

The Nipples of the Mother should be attended to weeks before parturition. They are to be drawn out occasionally and made pliable with cold cream to prevent subsequent retraction. After nursing, the nipple should be washed with boric acid solution. In the event of fissured nipple developing, associated with much pain in nursing, it is wise to draw milk with a breast pump and feed the child with a spoon or directly from a breast bottle. The fissure may be cauterized with 5 per cent nitrate of silver solution, after which a mild protecting salve of bismuth, zinc oxide, or aristol may be applied. The nipples may also be painted several times a day with the white of egg.

Pus in the Breast of the Mother; Mastitis; Caking.—When the breast becomes tender and before it is actually in a state of inflammation, a supporting binder should be applied and a dose of salts administered. In the event of suppuration nursing must cease. Milk should be removed artificially from the breast by the use of a breast pump. Suppurative mastitis is a surgical condition and demands operative interference.

In the new-born we meet frequently with a condition of mastitis usually brought about by meddlesome interference with the infant's nipple in attempts to squeeze out secretion. Such cases as a rule are of simple inflammatory type and respond in a few days to moist compress treatment.

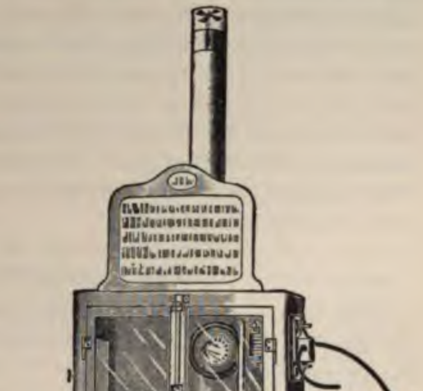

THE KNY-[illegible] CO.NY.

FIG. 37.—INCUBATOR FOR PREMATURE CHILDREN.

If inflammation of the mother's breast goes on to the formation of an abscess, incision is necessary. The incisions are to be made radiating from the areola to the breast periphery, and all pockets collectively and individually broken up. Sufficient and thorough drainage must be established with suitable drainage tubes. No region of an extensively involved mammary gland should be left unexplored by the finger, or the operation has been incompletely performed, thus necessitating a second and perhaps a third narcosis, additional surgical interference, with the associated depressing influences, and ultimate unsatisfactory results. The operation as above indicated is the only radical, rational, and correct practical method of satisfactorily attacking and treating the condition. Appropriate sterile dressing should be applied over the operative area and changed alternately for a few days, and at each change irrigation should be practised to insure patency of all the tubes inserted and to keep up the desirable thorough drainage. With the gradual closure of the drained areas, the tubes are removed and the wounds treated on general surgical principles of cleanliness until healing is complete.

WHEN CHILDREN BEGIN TO WALK

The following table records experiments upon 1,220 children and gives the age at which they commenced to walk, and should be of interest to young mothers:

AGE.	No. of Children.	Per Cent.
8 months	3	0.2
9 months and under	53	4.3
10 months and under	120	9.8
11 months and under	213	17.5
12 months and under	393	32.2
13 months and under	520	42.6
14 months and under	680	55.7
15 months and under	803	65.8
16 months and under	886	72.6
17 months and under	941	77.1
18 months and under	1,048	85.9
19 months and under	1,073	88.0
20 months and under	1,098	90.0
21 months and under	1,106	90.7
22 months and under	1,128	92.5
23 months and under	1,135	93.0
24 months and under	1,165	95.5

DISEASES OF THE NEW-BORN

Constipation.—This is to be remedied by soap water enemata, using a soft rubber rectal tube for insertion or by soap suppositories. If avoidable, do not resort to drugs to overcome constipation. Increase the percentage of fat in the food and give water. Gentle massage of the abdomen once a day is efficacious.

Jaundice very frequently appears in the first few days of infant life. As a rule it is transient, although it may persist for several weeks. Its presence is usually of no consequence, and frequently warm baths alone are efficient in dissipating the condition. When constipation is a factor, small quantities of Vichy water may be administered, a teaspoonful at a time. *Infectious jaundice* (Winckel's disease) is a grave condition. It is looked upon as an infectious epidemic hæmoglobinuria of the new-born, with cyanosis and jaundice, the jaundice and nervous symptoms occurring in the first week of life and ending fatally in coma and convulsions in pronounced cases. In the absence of definite knowledge on the subject, the management of this symptom complex will be symptomatic.

Colic.—The most frequent cause is overfeeding, and the majority of instances must be attributed to this factor. To overcome colicky attacks, regulate the time and quantity of feeding. As therapeutic agents, use warm baths, soap water enemas, warm mint tea, and rarely paregoric in five drop doses to counteract pain.

Renal Colic in Infants.—Uric acid infarctions are frequent in new-born infants. Gravel-stone and calcareous deposits are not infrequent. Gravel is often found in diapers. In such cases an abundance of water should be supplied to the infant.

Snuffles.—"Snuffles" in the infant is not always to be looked upon as syphilitic. Very frequently it is due to uncleanliness, and as a result a catarrhal condition is established. Treat by instilling salt water with a pipette into the nostrils and anoint the alæ of the nose with oil or lanolin or vaseline to prevent excoriation and crusts. Adenoid tissue may be removed by scraping with the finger nail.

Crowing Sounds and Congenital Stridor.—The majority of crowing sounds take their origin in the nasopharynx or larynx, and disappear when the children are older. A soft catheter should be passed through the nostrils to make sure of the absence of occlusion. Crowing sounds with and without stridor have been observed in cases of catarrhal laryngitis, spasm, paralysis and papilloma of the larynx, atelectasis of the lung, syphilitic bronchostenosis, retropharyngeal abscess, adenoid vegetations, enlarged thymus gland, congenital deformity of the superior laryngeal aperture, etc. Occasionally there is an obstetrical laryngitis due to aspiration of septic material by premature respiration on the part of the child in the course of a slow labor. In some cases it is only manifested on exertion.

PROGNOSIS.—In weakly children the condition may prove fatal. As a rule it passes off before the end of the second year.

TREATMENT.—A general tonic treatment or antisyphilitic régime is called for. The nasopharynx should be kept clean, and adenoids, if present, should be removed by scraping with the finger nail.

Ocular Hæmorrhages in the New-born.—Long and complicated labors naturally predispose to the occurrence of intraocular hæmorrhage. Extravasations are most likely in congenitally weak children, and in those with a family history of hæmophilia.

Atelectasis: Respiratory failure.—Congenital atelectasis is a persistence of the fœtal state in any part or the whole of the lung, and is associated with asphyxia of the new-born; but it may occur in feeble and premature infants without asphyxia. Such infants show evidence of malnutrition and have attacks of cyanosis ending in death or recovery after repeated attacks. When one lung is affected, we get a difference in percussion note and feeble respiratory murmur, occasionally râles.

TREATMENT.—The newly born should be made to cry, whether asphyxiated or not, in order to promote expansion of the lungs. Artificial respiration, as described under Asphyxia, and warm baths with friction may also be necessary.

The Breasts of the Infant.—The breasts of the infant may swell and become inflamed. They sometimes contain milk, and undue handling of the breast or prolonged attempts to express the milk are occasionally responsible for infantile mastitis. When fluctuation shows pus to be present, an incision is indicated.

Angeioma of the breast is occasionally observed in infants and requires surgical treatment.

Excoriations and Erythema are frequently caused by the irritation of dirty linen, and are most frequently situated in the flexed portions of the limbs, the neck, the buttocks, and the perineal region. Soiled napkins which have been insufficiently washed contain, when dry, urinary deposits which act as irritants. Rice powder, starch, cold cream, zinc ointment, and tallow are therapeutic agents of relief.

Pemphigus vulgaris (non-syphiliticus) is frequently observed in infants and runs a mild course, with but little fever, of about two to three weeks. The blebs contain serum which becomes turbid. It seems to be contagious and has a tendency to spread among children in institutions. Cleanliness is the best treatment. A protecting ointment of bismuth and ichthyol is necessary to cover the excoriated skin. Stearate of zinc powder may be dusted on the blebs and raw surfaces. Of course the general condition requires attention, and if syphilis is suspected as the underlying cause, specific treatment must be employed. The skin lesions of congenital syphilis will be discussed under Syphilis.

General Seborrhœa Sicca (Squamosa Neonatorum); Ichthyosis Sebacea.—The body is covered with reddish brown scales, and the skin is dry and shows painful fissures. If general it is usually fatal in new-born children.

TREATMENT.—Lanolin and ichthyol, 5 per cent. Try thyreoid treatment internally.

Congenital Ichthyosis (Grave Form).—The skin looks like furrowed parchment, the nostrils and ears are occluded by epithelial débris, and the skin feels hard and cracks or splits. The prognosis is bad. In mild forms life may be prolonged for years.

TREATMENT.—Cleanliness, baths, inunction with pure oil. Attention to the bowels. Lanolin and ichthyol, 5 per cent to 10 per cent. Try thyreoid treatment internally.

Sclerema and Œdema.—Both of these conditions may be congenital. The exact ætiological factors are not definitely known, although in œdema a poor, weak, disturbed circulation is a factor as well as symptom. The treatment is to be chiefly directed toward establishing better conditions of *nutrition* and appropriate stimulation. In sclerema the skin is hard and indurated as opposed to the softer, non-resistant feel observed in œdema. A subnormal temperature is present in sclerema, and the indications therefore are for the establishment of normal temperature by appropriate clothing, bathing, friction, and stimulation. The prognosis in sclerema is unfavorable. Possibly the administration of thyreoid extract may favorably influence the course.

Œdema may be confounded with sclerema. It begins soon after birth (also in premature infants), usually at the feet, and successively invades the whole body, particularly the extremities, the scrotum, and the labia. The œdematous parts are cold and pit on pressure. When the whole body is affected, the child's respiration is impaired, the pulse is slow, the temperature is subnormal, and the child is drowsy and dies.

Prognosis.—In complete œdema this is bad; in partial œdema, fair.

Treatment.—Hot water bags; wrap in cotton batting; general massage; proper feeding (higher percentage of proteids); camphor to stimulate the heart; five to ten drops of camphorated oil subcutaneously twice daily.

Birth Marks: Nævi, Telangeiectasis, Angeioma (Superficial and Cavernous).—There are three varieties of nævi in young children—superficial nævi, which disappear in time and do not require treatment, and superficial and cavernous nævi, which require surgical interference. Superficial nævi may be destroyed by the electrolytic process. The needle is connected by means of a needle holder with the negative pole of a galvanic battery and the current closed by means of a sponge electrode held in the patient's hand. A current of only a few milliampères is used. The current is broken by removing the sponge electrode. This is the same process employed for the permanent destruction of hair by electrolysis. The actual cautery, galvanic or Paquelin, is the most satisfactory means of destroying nævi. The part to be destroyed is cleansed with green soap and alcohol, and punctured in many places with the red hot needle point. Iodoform is dusted on the destroyed skin and a dry scab is allowed to form and eventually to fall off. One thorough treatment is usually all that is necessary. In case the vascular new growth has not been entirely destroyed by the cautery, a second application will be necessary. A cavernous angeioma is a strictly surgical affair and is best eradicated by the knife.

Umbilicus.—The stump of the cord is frequently the portal of entrance of infectious disease. Tetanus and erysipelas are examples. *Eczema of the umbilicus* is of common occurrence and responds to bismuth and zinc ointments. Keep the part dry and clean. *Polypus*, or *granuloma*, is removed mechanically by twisting the pedicle or by ligature or cauterization. *Omphalitis* involving the neighboring abdominal tissues may go on to suppuration and gangrene and spread over a considerable area. If an abscess forms, incision and drainage are indicated. In *umbilical sepsis* of the new-born there is usually fever and there may be purpura or petechia. There may be bleeding from the vagina and nose, vomiting, and muscular rigidity. This symptom complex is characteristic and enables us to distinguish such cases from hæmophilia. Pronounced cases are fatal. We must look to the future for an antitoxine for this form of sepsis, which may be avoided by proper management of the cord.

Tetanus.—This is an acute specific infection. It sets in at about the fourth or fifth day. The portal of entrance is the stump of the cord. In nursing, the jaw becomes rigid and the face drawn. The body of the child becomes stiff and in the intervals relaxed. Fever sets in and death takes place from exhaustion or asphyxia. The mortality is about 90 per cent.

TREATMENT.—Tetanus antitoxine should be administered, together with small doses of chloral hydrate (about half a grain) and bromide of potassium (about one grain), every two to three hours. Also use warm baths at 95° F., with mild massage and proper feeding. Obstetrical cleanliness prevents tetanus infection.

Trismus.—Mild cases of tetanus have been termed trismus. The exact relation between trismus and tetanus is not known, but it is a fact that many cases of so called trismus get well under hygienic management and the administration of bromide and chloral.

Fatty Degeneration (Buhl's Disease) is an acute fatty degeneration of the viscera—(heart, lungs, liver, and kidneys)—with a tendency to hæmorrhage, no special rise of temperature, and early death from asthenia or acute hæmorrhage, probably due to infection. The treatment is symptomatic.

Congenital Rigidity (Little's Disease).—A congenital rigidity of the lower extremities, probably due to syphilis, is known under this name and may necessitate symptomatic and specific management.

Hæmorrhagic Disease.—Not all cases of hæmorrhagic disease are due to hæmophilia, which is rarely manifested before the end of the first year. On the other hand, infants known to bleed during the first days of life recover and are not apt to bleed in after life. The hæmorrhagic phenomena which are associated with various forms of umbilical sepsis are mentioned elsewhere.

Umbilical Hæmorrhage.—Bleeding from the cord or navel wound may be due to negligence in tying the cord. The writer has met with a few cases of severe hæmorrhage from the navel cord on the third to the fifth day. A hæmorrhagic state, or dyscrasia from congenital syphilis or from intestinal putrefaction and toxæmia of the mother, may be the causative factor.

TREATMENT.—Apply strong alum water. Ten per cent solutions of antipyrine and adrenalin solution are powerful local styptics. If they fail to check the hæmorrhage, the skin should be transfixed with needles and pressure exerted by means of a silk suture wound around and underneath the pins. Stypticin may be given internally in half grain doses, or injected hypodermically, dissolved in water. A single bleeding point may be touched with the actual cautery.

Gastrointestinal hæmorrhage may set in at any time during the first week after birth. The blood comes from the stomach and bowels in smaller or larger quantities, usually in dark masses. It may be due to: (*a*) *Syphilis, sepsis, hæmophilia, etc.;* (*b*) *Local ulceration in the gastrointestinal tract;* (*c*) *Injury related or not related to labor.* In most of the cases observed by the writer the infants appeared healthy and were of healthy parentage. The children usually die within one half to two days, but occasionally recover. The heart's action is generally very rapid, and finally the pulse is no longer felt. If the blood coagulates in the stomach, vomiting expels it. The PROGNOSIS is unfavorable.

TREATMENT.—Careful and judicious feeding and stimulation. If the infant cannot suck, give the mother's milk from a spoon. Enjoin perfect rest and apply ice to the stomach and hot water bags to the surface. Adrenalin solution, gtt. 5, or an aqueous solution of suprarenal extract (Gr. V to ℥j), dose 10 gtt., may be given every half hour. Alum water, 1–20, may be used internally, in doses of ten drops, also as an enema. Stypticin, gr. ½ internally every hour, is useful. Two to four drachms of a sterile solution of gelatin may be injected subcutaneously or may be given by mouth or per rectum.

Intussusception.—This is rare in the new-born, but of considerable frequency in early infancy. The symptoms are not pathognomonic, although vomiting, tenesmus, and mucus and blood in the stools suggest the possibility of the condition. Abdominal palpation frequently reveals the presence of a tumor. Rectal palpation often establishes the diagnosis where other manipulations and symptoms fail to indicate the trouble. The introduction of water under moderate pressure into the rectum may effect the desired reduction of the tumor. Where this simple procedure fails, operative interference is indicated. Moreover, in these cases surgical interference should be prompt, as delay is hazardous.

Umbilical Hernia.—This, as a rule, is readily reducible, and frequently recovery is spontaneous. A small button-shaped pad is laid over the umbilicus after reducing the hernia, and a strip of adhesive plaster applied to keep the pad *in situ*. Specially constructed pads and appliances are now to be had in the shops for this class of cases.

Inguinal Hernia, where reducible, may be kept in place by applying a truss or by adjusting a worsted skein with the knot over the seat of hernial protrusion. In the reduction of hernia care must be exercised in the manipulation; an irreducible hernia demands surgical interference. Do not confound inguinal hernia with hydrocele. The former is translucent to transmitted light—the latter opaque.

Operation for Hernia in Children.—An operation is seldom advised under the age of four years except in strangulated cases. The reason for this rule is that many of these cases, probably two thirds, are cured by a truss. After the age of four years, in all cases in which a truss has been tried and failed, and in cases in which the presence of reducible hydrocele prevents a truss from holding the rupture, an operation is advised. The same rules hold good in irreducible omentum, a rare condition in childhood.

Caput Succedaneum is the swelling which appears on the scalp *intra partu*. It disappears in due time and requires no treatment.

External Cephalæmatoma.—These swellings are due to blood extravasations between the skull and pericranium, and most frequently are of traumatic origin, caused by undue forceps pressure, prolonged labor, or malposition with difficult delivery. They usually make their appearance a few days after birth, gradually enlarge, and are soft and fluctuating to the touch. Generally there are no associated evidences of inflammation, and the recovery is spontaneous, absorption taking place in four to sixteen weeks. Should infection and consequent abscess formation ensue, incision and drainage on antiseptic principles constitute the proper treatment.

Internal Cephalæmatoma.—This is a hæmorrhage between the dura mater and the cranium, and may lead to all the manifestations of intracranial hæmorrhage (apoplexy), viz. convulsions, paralysis, meningitis, and cystic degeneration, with recovery, idiocy, or death. An external hæmatoma may extend through a cranial fissure or fracture to the cranial cavity. The treatment is usually expectant, in the hope of spontaneous absorption of the extravasation. Intracranial surgery has its limitations in the new-born.

Hæmatoma of the Sternocleidomastoid is a firm, hard tumor of traumatic origin in the tract of the muscle. It disappears in time and requires no treatment except mild massage.

Meningocele and Encephalocele are terms used to designate the protrusion of some part of the cranial contents through an opening in the skull. These conditions are analogous to spina bifida.

MENINGOCELE is a protrusion of a portion of the arachnoid fluid with its sac through one of the cranial openings and communicating with the arachnoid cavity. It is smooth, fluctuating, perfectly translucent, rarely pulsating, and often reducible. Occasionally we meet with a meningocele in the nasofrontal region. The treatment by aspiration and injection with iodine is sometimes satisfactory and followed by permanent recovery, but not always so. Marked reaction has followed operative procedure, and death from meningitis has taken place. An operation is justifiable in cases of impending rupture.

SPURIOUS MENINGOCELE from traumatic fissure of the *cranium and dura* is occasionally observed. The tumors are translucent, elastic, and generally small, and require no special treatment. If a differential diagnosis between hæmatoma and meningocele must be made, an aseptic aspiration can be done. The elevation of a depressed bone may be indicated when epileptic seizures occur.

In ENCEPHALOCELE the tumor is smooth, rarely pedunculated, and not translucent, and does not fluctuate. It contains *meninges*, *fluid*, and *brain substance*. Encephalocele is not to be confounded with hæmatoma. In the former the swelling is situated at the fontanelles, or along the cranial sutures. Encephalocele increases and varies in size with the movements of respiration, and is often accompanied by cerebral symptoms. The treatment is by compression. The most pronounced case of this kind is one seen in consultation with Dr. H. Fischer, of New York. As shown in Figs. 38 and 39,

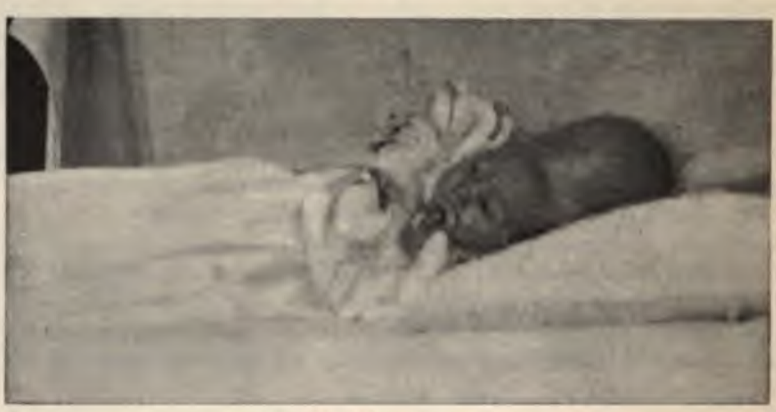


FIG. 38.—ENCEPHALOCELE.

Vault of cranium absent. Age one year. (H. Fischer.)

the top of the skull is absent and the brain is prolapsed into a sac formed by the scalp, and lies outside of the cranial cavity. At the age of six months the child was under the knife in one of our city hospitals, where the actual condition was not recognized. When the sac was opened and the brain presented itself, the surgeon saw his mistake and beat a retreat. The child at the present time is four years old and in good health, excepting occasional epileptoid attacks.

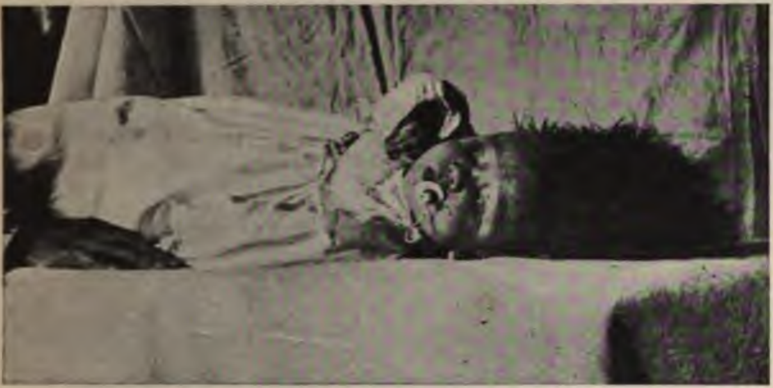


FIG. 39.—ENCEPHALOCELE AT THREE YEARS.

Chondrodystrophy fœtalis is, as its name implies, a faulty development of cartilage resulting in deformity. The causative factors of this condition are unknown.

Stunted growth (achondroplasia) was formerly spoken of as fœtal rickets or fœtal cretinism. It differs from cretinism in the absence of the mental defects which characterize the cretin. There are two features in the limb bones which suggest, at first sight, a similarity to rickets. The one is curvature of the shafts, the other a prominence of the terminal epiphyses. But the bending in the case in question is not due to softness of the bones, as in rickets; on the contrary, the bones are quite firm and rigid. Moreover, there is no actual enlargement of the terminal epiphyses. The knobbed appearance in this case is explained by relative smallness of the shafts. In achondroplasia the bones resulting from ossification in membrane are formed as usual, but the parts which are ossified in cartilage in early fœtal life are stunted in their development, as if from premature arrest of the ossifying process, and hence the defect in the long bones of the limbs, the ribs, the pelvis, and the greater part of the base of the skull and the concomitant disfigurement of the skull and upper portion of the face. In most instances it would appear that the fœtus, when the subject of achondroplasia, either dies in utero or shortly after birth. Only a few patients have grown into childhood.

Congenital Lipoma is an elastic, non-compressible tumor found anywhere on the surface. It may disappear or persist, and need not be interfered with unless it gives rise to local disturbance or discomfort.

Congenital Hygroma and Cysts.—These occur on various parts of the surface. Their accumulation of fluid contents can be removed by a simple incision. Should the fluid reaccumulate, the subcutaneous sac must be enucleated in toto under anæsthesia. Congenital cysts of the kidney are occasionally observed.

Congenital Hydrocele.—The diagnosis of encysted hydrocele of the cord, hernia, and undescended testicle is sometimes difficult. A congenital hydrocele often disappears after a few weeks.

Congenital Malformation of the Heart (blue babies).—Such ailments are of little practical importance; the children so afflicted frequently succumb to some intercurrent disease. Cases which at birth give evidence of a systolic murmur, which ultimately disappears, may be cases of persistence of the ductus arteriosus, which sometimes closes spontaneously. In blue babies with patency of the foramen ovale we may and may not hear a murmur. There is no active treatment for any of these cases. In some instances, owing to a profound disturbance of the circulation, the

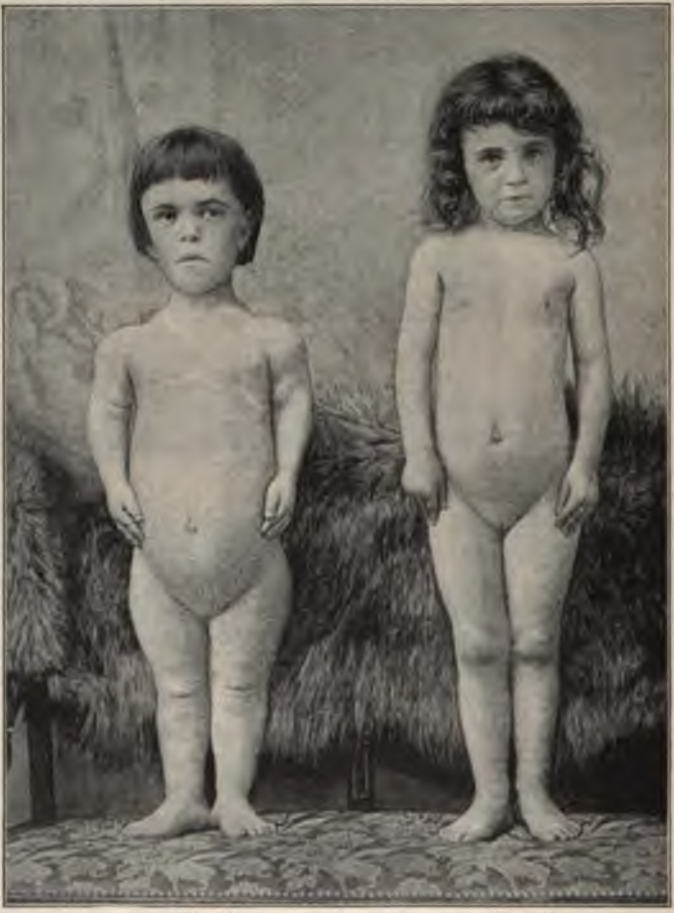

Dwarf. Normal.

FIG. 40.—ACHONDROPLASIA.

suffering is so intense as to warrant the use of opiates or chloral hydrate at night.

Enlarged Thymus Gland.—This condition may give rise to heart murmurs, respiratory stridor, and sudden death, as illustrated by the following case: An infant six weeks old was observed to be restless with spells of rapid breathing. A careful examination revealed a loud systolic murmur at the base of the heart which was not transmitted in any direction and which did not take the place of the systolic click of the valves. The heart dulness extended upward and laterally beyond the normal. The baby had one or two convulsions, from which it rallied promptly. It died very suddenly without premonitory signs. At the autopsy the heart was found to be intact, the ductus arteriosus was closed, and the thymus gland was very large and so located as to encroach by pressure upon the lumen of the aortic arch and pulmonary artery. It may be of practical importance to know that the enlarged thymus gland may be recognized by percussion upward as the child is held face downward. The removal or high fixation of an enlarged thymus gland is a surgical possibility. See also article on the Thymus.

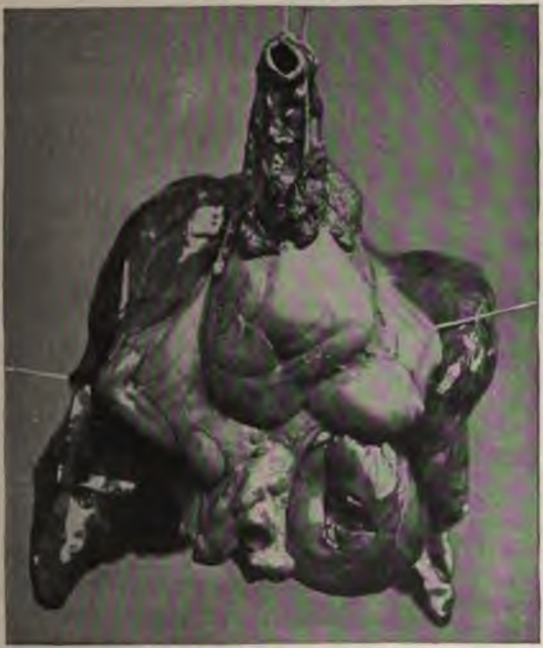


FIG. 41.—ENLARGED THYMUS. (Dr. Cox.)

Birth Palsies.—These in a majority of instances are the result of pressure or injury induced by artificial delivery (with forceps), or in prolonged labor from undue pressure by the maternal parts. In difficult labor (breech presentations) the parts involved are usually one or more of the extremities, Erb's paralysis being a familiar type in which the upper arm is involved. Facial palsies due to pressure of the forceps on the facial nerve are not of rare occurrence. Forceps neuritis of the neck is another form. CEREBRAL PALSY, a result of hæmorrhage at the base of the brain, is still another form. The TREATMENT of the types commonly met with is by faradism, galvanism, vibration, and massage. In instances where injury to the nerve supply is extensive and no response to treatment ensues after a few weeks, permanent paralysis with accompanying atrophy of the muscles supplied ensues, and the use of the limb is impaired. Nerve suture and nerve anastomosis are surgical possibilities (see also Neurological Memoranda).

DEFORMITIES; MALFORMATIONS

Common Forms

Hare lip and **cleft palate** are among the most frequent of congenital deformities. Their treatment is strictly surgical, but operative interference should not be resorted to at too early a period. It is wise to wait until the child acquires a little vigor and is better able to withstand operative measures. Meanwhile the mouth, nose, and throat should be kept scrupulously clean. If the infant cannot nurse well as a result of the deformity, it may be necessary to temporarily feed it artificially by means of a specially constructed nipple with a rubber flap attachment which adapts itself by the suction to the opening in the palate.

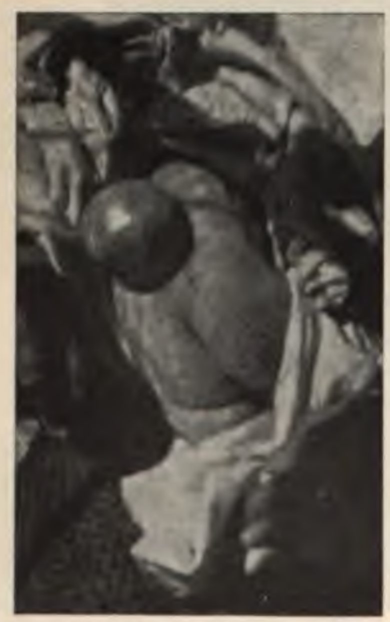


FIG. 42.—SPINA BIFIDA.

Imperforate anus and **rectal stenosis** demand early relief. The simple variety of cutaneous anal atresia is easily remedied by simple incision and digital dilation. Atresiæ higher up in the rectum require skilful dissection by the surgeon. *Atresia* of the rectum with communication between rectum and vagina is occasionally found. In such cases the fæcal matter escapes through the vulva. If there is no obstruction to the passage of fæces, operative interference should be delayed until the parts are large and more developed.

Tongue tie exists more in the imagination of the mother of a child than in fact. Whenever the frenum of the tongue is too short, put the tongue on the stretch by inserting two fingers into the mouth under the tongue, and cut the frenum with blunt scissors while it is on the stretch. *Bifid tongue* and *bifid uvula* are occasionally met with.

Spina Bifida.—This is a not uncommon malformation of the spinal canal with a cystlike protrusion of its contents—cerebrospinal fluid. The elastic and compressible tumor may be simply a meningocele (membrane and fluid) or meningomyelocele (membrane, cord, and fluid). Spina bifida is readily recognized, but it is occasionally difficult to tell which variety we have to deal with. The simple spina bifida frequently heals spontaneously. The bony aperture closes and the cystic sac dries up. Under all circumstances the tumor must be kept clean and protected by cotton batting. Simple aspiration and compression are usually of no avail. When there is no danger of rupture, operative interference is not urgent and may be deferred until the child is older. Aspiration and injection of iodine solution is a procedure not free from danger. Ligature and excision of the sac is a safe operation. Plastic operations with an attempt at closure of the aperture by flaps of neighboring periosteum have been attempted with varying success. In the worst cases there is paralysis of the bladder and rectum.

Hypospadias.—In this condition the urethra opens on the inferior surface of the penis. In front there is only a shallow furrow. In severe cases there is a deep fissure which divides the scrotum, and when in addition the testicles are undescended, the case is erroneously taken for hermaphroditism.

Epispadias.—The urethra opens on the dorsal side of the penis, and the condition may be complicated by exstrophy of the bladder. An analogous deformity is met with in girls. All these deformities are compatible with long life, and can be removed in many cases by a plastic operation.

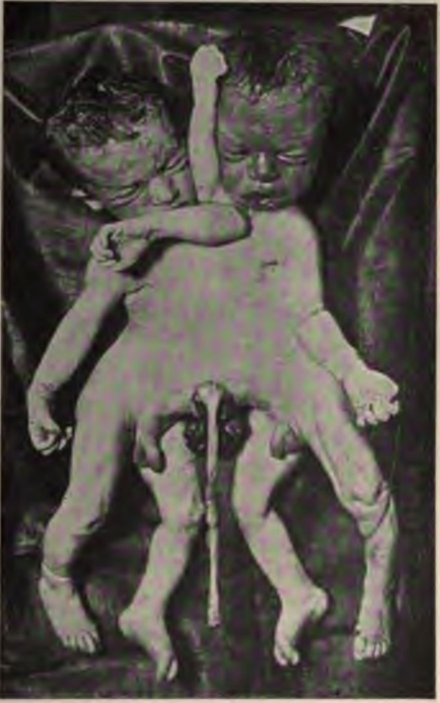


FIG. 43.—THORACO ABDOMINO PAGUS. (Dr. Sheffield.)

Cryptorchidism, or undescended testicle. In fœtal life the testicles are situated in the abdominal cavity, below the kidneys. In about 10 per cent of all children they fail to descend into the scrotum at full term, but come down during the first few weeks of life. When one remains in the inguinal canal, it should be let alone *unless very painful*, when it should be removed, or better, an attempt should be made to put it into its proper place.

Phimosis.—This condition is frequently met with and varies in degree. Where there is simply a short prepuce with moderate epithelial adhesions, the condition may be corrected by stretching. When the prepuce is long, and stretching will not remedy it, circumcision is resorted to; but this operative procedure may be delayed until about the ninth month if there is no difficulty in micturition. The method is as follows: Under general anæsthesis the prepuce is drawn forward, placed between the blades of a narrow artery forceps, and the presenting portion snipped off with scissors. On removing the forceps, the *redundant inner (or mucous) layer presents itself,* which is removed in the same way, and a few sutures of black silk are inserted in such a manner that the bleeding vessels are also included. A mild antiseptic ointment is applied, the part placed in suitable lint, and the diaper applied. The sutures may be removed about the fifth day. The object of applying black sutures is that they may be readily detected when the time for their removal arrives. A simpler method, very often satisfactory, is to cut a short distance into and along the dorsal aspect of the prepuce until the glans is exposed, and take a stitch in either flap of the prepuce so cut and dress aseptically. Unrelieved phimosis, on account of local irritation, may affect the general health of delicate children.

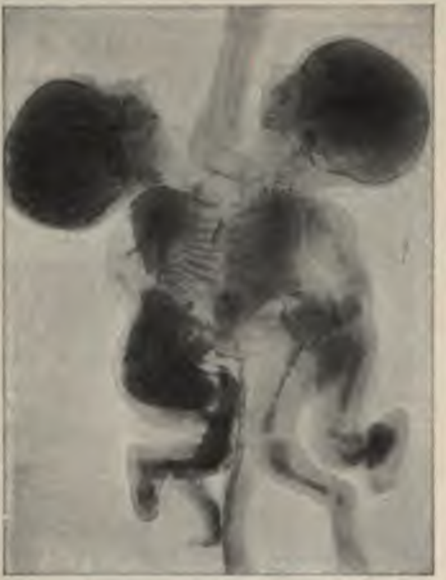


FIG. 44.—THORACO ABDOMINO PAGUS. (Skiagram).

Web Fingers and Toes; Supernumerary Digits. — These call for plastic surgery or extirpation. *Club foot* and other deformities due to undeveloped conditions or as the result of intrauterine constricting bands call for special orthopædic and surgical treatment. (See chapter on Orthopædics.)

Rare Forms

Atresia Oris; Microstoma.—The lips are grown together entirely or separated by a small opening. This malformation is usually due to syphilis and necessitates constitutional treatment and a cheiloplastic operation. **Atresia pupillæ congenita** is a rare malformation in which spontaneous improvement usually occurs. **Atresia of the small intestine** is rare. The symptoms are early and persistent vomiting. Nothing passes from the bowels after the meconium has escaped. Death occurs within a week unless operative interference is successful. **Atresia urethræ** is generally epithelial, but occasionally membranous; blunt pressure or an incision will overcome the obstruction. **Atresia vaginæ hymenalis** usually escapes observation until puberty, and then requires incision and packing. **Cloaca congenitalis.** In the absence of the anus the rectum may end in the bladder, vagina, or urethra. This condition may be remedied by operative interference.

Congenital Hypertrophic Stenosis of the Pylorus and Duodenum.— This is a far more frequent affection than is supposed, but the condition is not generally recognized, as the symptoms may easily be misinterpreted.

The essential feature of the morbid anatomy is the thickening of the circular muscular fibres of the pylorus or a fibrous thickening.

DIAGNOSIS.—Vomiting, dilatation of the stomach, and visible gastric peristalsis with emaciation are marked features. *Dyspeptic symptoms* are first noticed, and subsequently the dilatation of the stomach and obstinate constipation point to an obstruction in the course of the gastroenteric tract, but the pyloric tumor is not felt, on account of abdominal tympanites. When the stomach contents are siphoned out they are generally found to contain bile. In some instances the bowels move tolerably well until a few days before death. In the majority of the cases reported the initial symptoms were noticed during the first two weeks of life; in one or two instances as late as in the third or fourth month.

TREATMENT OF CONGENITAL PYLORIC STENOSIS.—The feeding should be regulated, and the stomach may be washed with a ½-per-cent solution of Carlsbad salt in water. Drugs are useless; massage may be employed and a stomach binder applied. If necessary, rectal feeding may be employed. In extreme cases pyloroplasty is indicated. Digital divulsion of the pylorus (Loreta's operation) is not feasible in infants. Before operative interference is attempted *mild forms of Spasmodic Stricture must be excluded.* Muscular hypertrophy at the pylorus may be secondary to overaction of the sphincter, and injudicious feeding may be a contributing factor to spasm and nervous incoordination.

Bronchocele and a Branchial Fistula.—Persistent congenital conditions as the result of imperfect closure and development of the branchial arch are strictly surgical conditions and call for surgical interference.

Congenital Pharyngoœsophageal Stenosis is a very rare malformation in which the upper part of the œsophagus at its junction with the pharynx ends in a blind pouch. A case of this nature was reported to the *American Pædiatric Society* in 1896 by S. S. Adams, M.D., of Washington, D. C.

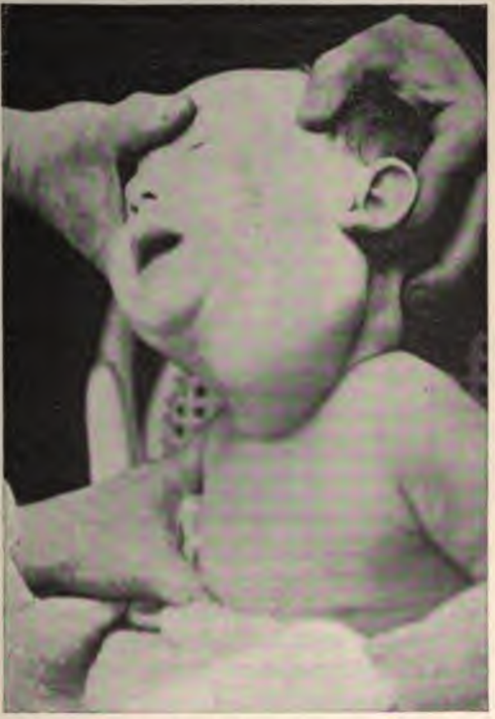


FIG. 45.—BRONCHOCELE.

Congenital Stenosis of the Larynx is rarely observed. The infants, instead of crying, emit a muffled sound.

Cranial Asymmetry.—This is no unusual occurrence. It is due to antenatal trophoneurotic, rhachitic, or syphilitic disturbances.

Umbilical Fistula.—The common form is an umbilical conical tumor with a fistula at its summit representing the remains of an embryonal formation known as the omphalomesenteric duct. These tumors are of various sizes, pink in color, with an oozing discharge from the centre. They may become obliterated or be cured by ligature. The large tumors of this nature require careful surgical dissection.

Stigmata of degeneration and manifold deformities are observed which usually present more of a surgical than medical aspect. The same is true of malformations and monsters.

Wormian Bodies.—When ossification of any of the tabular bones of the skull proves abortive, the membranous interval which would be left is usually filled in by a supernumerary piece of bone. This is developed from a separate centre, and gradually extends until it fills the vacant space. These supernumerary pieces are called Wormian bones (after Wormius, a Copenhagen physician). They are also called, from their usual form, ossa triquetra, but they present many variations in situation, number, and size. They occasionally occupy the situation of the fontanelles.

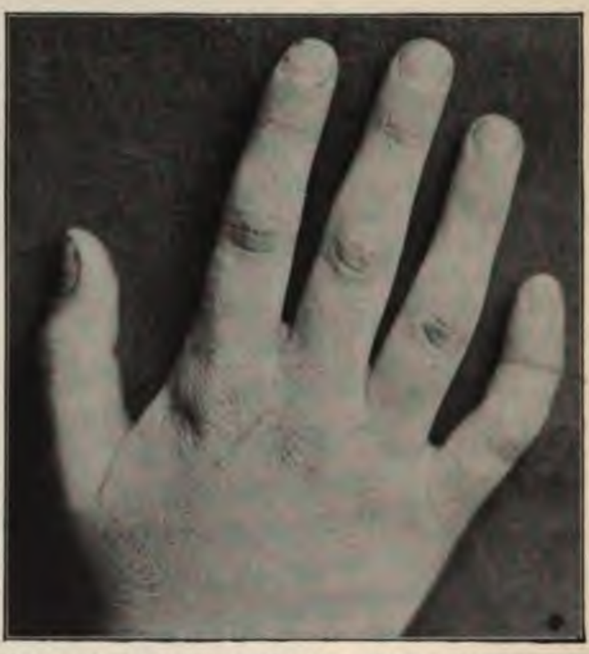


FIG. 46.—MARKED CURVE IN LITTLE FINGER OF MONGOLIAN IDIOT. (Dr. West.)

Congenital fissures and gaps are occasionally found in the cranial bones, the result of incomplete ossification. They extend from the margin toward the middle and might be mistaken for fractures. In hydrocephalic skulls they are most frequent in the frontal bones and in the parietal bones on either side of the sagittal suture.

Maternal Impressions.—Strong impressions of terror, pain, disgust, etc., experienced by the mother during pregnancy are supposed to be responsible for bodily defects in the infant, such as hare lip, cleft palate, club foot, moles, strawberry marks, etc., but this has not been proved. Pending a final decision on this obscure subject, it may be well to guard a woman during pregnancy as much as possible from unpleasant impressions.

Fractures.—An infant's cry indicative of pain, disability as to motion, dimpling of overlying tissues, and swelling of the soft parts, leads to the diagnosis of fracture. A displacement shown by the radiograph is conclusive evidence. Fractures may be antenatal or occur at birth from abnormal conditions present or from traumatism in precipitate or difficult labor. The common fractures are those of the humerus, the clavicle, the femur, the cranial bones, etc.

Infant Mortality.—Ten per cent of the new-born are lost from various causes before they are one month old. Responsible for this mortality are:

MATERNAL CAUSES before and during labor, including protracted labor and asphyxia.

FŒTAL CAUSES are antenatal disease and accidents, multiple pregnancy, malposition and excessive size of the child, congenital feebleness and prematurity, and convulsive disorders.

Sudden death of infants is not an infrequent occurrence from manifold causes which usually cannot be elicited except through an autopsy.

INFANT FEEDING

BREAST FEEDING; MATERNAL NURSING

General Considerations

It may be regarded as axiomatic that every healthy mother should nurse her own baby. A mother's milk is the natural food of the infant and is more in harmony with the special requirements of the offspring than any substitute form of nourishment. This close tie between mother and child must not be severed on insufficient grounds. No kind of bottle food can compete with the milk from a healthy breast; a perfect substitute for the healthy human breast milk is and always will remain an impossibility. Infants, however, do not invariably thrive at the breast, and it therefore becomes necessary for the intelligent practitioner to acquaint himself with the composition of human milk, that he may be able to recognize what elements or factors are at fault in a case of infantile indigestion in a breast fed child, that the condition may be remedied or that an artificial food may be substituted. This must have as its basis, under all circumstances, the composition of breast milk. Breast fed children not alone show indigestion in its various phases, but not infrequently have rhachitis, scurvy, or cholera infantum; and much of the success of the family practitioner will depend upon his knowledge of the dietetic management of the breast and bottle fed child.

It will be well to keep in mind a few physiological points in reference to the composition of human breast milk and the conditions influencing the uniformity of its composition. A good breast secretes from one to three pints daily and is emptied in about fifteen minutes. The milk has a specific gravity of about 1.030, and is of the following composition, with variations:

Water	88 per cent	Fat. Proteids.
Solids	12 per cent	Sugar. Ash.

The so called "fore milk" consists of about 10 per cent solids and 90 per cent water; the "stripping," of 15 per cent solids and 85 per cent water—this difference of 5 per cent in the composition of fore milk and stripping it is important to note, as we shall presently see. According to Johannsen, the highest percentage of solids is noticed about three P.M. daily; the lowest percentage of fat during the night, when it sinks to 1 per cent.

The average stomach capacity of a healthy infant is about as follows:

At birth	1 ounce.
" 2 months	3 ounces.
" 6 months	6 ounces.
" 12–14 months	9 ounces.

The average gain of a healthy infant at the breast is about half an ounce a day.

The stomach capacity of breast fed children in general is less than that of artificially fed children. The capacity of a healthy stomach is smaller than that of a functionally inefficient stomach. Large capacity may be due to a narrow pylorus; large stomachs without pyloric stenosis are usually overdistended stomachs. It has been quite conclusively established that very little fluid is absorbed from the stomach; we must assume, therefore, that in cases in which there is no gastrectasia, the quantity of milk frequently taken in excess of the normal stomach capacity is never completely retained at one time in the stomach, but oozes through the pylorus into the intestine and does not so frequently overtax the stomach of otherwise healthy infants as is supposed and feared. On the other hand, in motor insufficiency, from anæmia and other causes, overfeeding may produce disastrous results and conditions in infants as well as in adults. Among the many conditions affecting the composition of breast milk we may bear in mind the following: *Age of the mother; number of pregnancies; nervous influences* (*epilepsy, convulsions, worry*); *diet of the mother; exercise of the mother; regularity of nursing; menses; acute or chronic illness* (e. g., *tuberculosis, syphilis, nephritis, typhoid, cancer*); *suppuration of the breast—sepsis; cachexia from other chronic or acute febrile disease; drugs.*

Hence, as influenced by these factors and conditions, we may have: *a.* Overrich milk; *b.* Abundant normal milk; *c.* Scanty normal milk; *d.* Abundant poor milk; *e.* Scanty poor milk—producing in the infant, sooner or later, no gain or loss of weight, colic, no sleep, bad stools, with or without fever, incessant crying for food, rhachitis, scurvy, etc.

Nursing mothers over forty years of age do not have rich milk as a rule, and the same holds good for mothers who have borne children in rapid sequence. The milk of neurotic or emotional mothers is far from normal, and is not apt to be influenced very favorably by judicious management.

The diet and exercise of the nursing mother are of great importance in the production of good milk. Liberal feeding and no exercise will frequently give an overrich milk with 6 per cent of fat; hard work together with poor food is responsible for a very poor milk with less than 1 per cent of fat. Irregularity in nursing makes good milk bad, and frequent nursing is found to give a concentrated milk and produce colic in the child; too prolonged intervals in nursing are apt to decrease the total solids and produce a milk easily digested but not nutritious. A very concentrated milk may be nutritious, but is difficult to digest.

Acute and chronic illness often occasion bad breast milk, particularly such diseases and conditions as tertiary syphilis, nephritis, typhoid, and sepsis. The milk from a suppurating breast is not proper food for an infant, and it has been alleged that pus taken with the breast milk is occasionally responsible for multiple furunculosis in infants. During the catamenial period the breast milk changes in composition, inasmuch as the fat percentage is low; but, as this period of depression lasts but a few days and former conditions are again established, the appearance of the menses is not a direct contraindication for the breast. Finally, it is well to remember that all secretory and excretory organs of the body are in close touch with the general circulation, and powerful drugs are apt to exert their effects upon an infant through the medium of a nursing mother.

The following analysis, taken from Rotch, expresses in percentage the various changes in the composition of breast milk:

Normal.	Catamenia.	Starvation.	Overrich.	Neuropathic constitution, pregnancy, diseases.
Fat............4.	1½	1.	5–6	¾
Sugar.........7.	6.	4.	7.	5.
Casein.........1½	2½	2½	3½	4½

Contraindications for Breast Milk.—Tuberculosis, cancer, syphilis, epilepsy, any form of sepsis, cachexia from chronic or subacute disease, very acute illness, convulsive attacks—all of these conditions are prime indications for weaning. In a case of sore nipple without suppuration of the gland the milk may be pumped from the breast and fed from a breast bottle.

In case of pregnancy or gradual diminution of the milk supply of the mother, it will not be necessary to wean suddenly. If possible, wait for the approach of cold weather before taking the child from the breast, gradually substitute other food, and have no regard for dentition. When the breast supply gives out gradually, it is a very good plan to give half breast and half bottle food. The selection of the latter will depend upon circumstances. All things being equal, diluted top milk, sterilized in warm weather, should be selected (see cow's milk for infant feeding).

How to Influence the Composition of Mother's Milk

If a child at the breast shows symptoms of dyspepsia and no gain in weight, study the conditions affecting the composition of the mother's milk as discussed in the foregoing remarks, and if possible determine the amounts of fat and proteids in the milk. If the milk is overrich, the mother is to be placed upon a plain diet; and the inactive, phlegmatic, lazy mother should be made to engage in active exercise (*e. g.*, walking). If the milk is poor in the beginning of nursing, appropriate efforts should be made to increase the percentage of fat by allowing the mother a liberal diet of albuminoids (eggs, meat), and curtailing exercises. Liquids (beer, porter) increase the flow of milk, but do not enhance its richness. Fat does not increase fat. (See article on Diet.)

In making an analysis of milk for practical purposes we have to inquire into the percentage of fat and casein therein contained. The microscopical and specific gravity tests are uncertain and furnish no very definite data. The Babcock and other centrifuge tests for fat are adaptable for laboratory use and purposes. Many physicians are fortunate enough to be able to rely upon the services of a friendly apothecary for ordinary analysis.

To *approximately* determine the percentage of fat present in the milk under investigation, a small calibre test tube graduated from 1 to 100 is filled to the 100 mark with milk pumped from the breast, an indefinite quantity of ether is added thereto, and the contents are thoroughly shaken. After the lapse of half a day, on standing, the liquid separates into two layers, ether and fat, and milk minus fat; then, for example, if the point of demarcation between the two layers is at 97, we have 3 per cent of fat represented in the specimen examined. We now decant the ether and fat solution and precipitate the casein contained in the skim milk by the addition of acetic acid or rennet; the curd formed is then collected on a filter (the weight of the filter being known), and the salts, etc., are washed out with water; filter and curd are dried in an oven and weighed together. Deduct the weight of the filter from the total weight and the weight of the curd remains; thus, e. g., if in a test tube graduated in grammes the weight of the curd was found to be 2.0 gm., the percentage of proteid is two, approximately. An inexpensive Swiss milk tester in the shape of a flat disc can now be obtained, which enables one to tell rich from poor milk at a glance. *Holt* has devised an inexpensive milk tester.

Summary

Overfeeding, excessive fats or proteids, may cause dyspeptic symptoms in the nursing infant. Proteids and fat in mother's milk may be increased or diminished in many cases by diet and exercise. A deterioration of the breast milk occurring early or toward the end of lactation is accompanied by insufficient gain or loss of weight in the child unless the condition of the milk can be improved or an addition made to the child's diet. The proteids are high during the colostrum period, and may provoke dyspeptic symptoms in the premature or full term infant.

The dietetic management of infants is not solely a question of accurate percentages of fat, casein, and sugar; the *composition of breast milk* *varies within certain limits all the time, in the healthiest individuals; it varies from day to day and varies within the day.* Those who attempt to regulate the physiological processes occurring in the animal economy by methods brimful of mathematical accuracy, viewed solely from the standpoint of chemistry, are as much at fault as those who make no attempt to study and understand the subject. The chemical behavior of food stuffs in the laboratory is entirely different from the chemical behavior in the animal economy. Conclusions drawn from such comparisons as practically applicable to the necessities and workings of the human economy are frequently grossly erroneous. In our attempts to aid and imitate nature, common sense will establish limitations and keep us away from gross scientific errors.

HOW TO NURSE

The new-born child may be put to the breast after the mother has had a refreshing sleep. In the mean time or in case the milk is somewhat delayed, it may receive warm and sweetened fennel tea. Should the milk be delayed beyond the second or third day, artificial feeding must be done at regular intervals. Almost all infants can be trained to nurse and sleep regularly. Mothers and nurses who fail to appreciate this fact, or lack the necessary firmness and common sense, will suffer much wear and tear during the nursing period. For the first two months ten feedings a day are the average, including two night nursings; and it should be the aim of the mother or nurse to accustom the child to abstinence and sleep for four to six hours at night. As the child grows older, the intervals between nursings increase, and one night nursing will suffice.

After the child is six to eight weeks old, it should be taken out of doors in all but stormy weather for from two to six hours each day. The sleeping room should not be heated above 65° to 68° F. Children kept indoors in overheated apartments become dyspeptic in a short time. Medication in such cases is absurd—fresh air to breathe is Nature's tonic and digestant.

Wet Nursing.—If maternal feeding is out of the question, a good wet nurse is to be preferred to artificial feeding. It is the writer's experience that children artificially fed, all other factors being equal, succumb more readily to severe infectious disease than do breast fed children. At the same time it must be emphasized that in private practice infants can be raised on the bottle without much difficulty. The moral question involved in depriving an infant of a poor mother of its natural nourishment is usually not taken into serious consideration, but, inasmuch as a healthy woman with full breasts can readily nourish two infants until they are several months under way, such an arrangement might well be suggested by a well meaning physician.

In selecting a wet nurse, the physician will investigate carefully as to marked anæmia, syphilis, tuberculosis, gonorrhœa, the condition of the breasts, nipples, lymph nodes, etc.; and endeavor to secure for the nurse the proper diet and sufficient rest to insure if possible an adequate supply of good milk. A wet nurse need not be rejected if her child is four or six weeks older than the one to be nursed.

Weaning.—Deterioration in human milk is marked by a reduction in the proteids and total solids. This deterioration takes place normally during the later months of lactation, and is accompanied by a loss of weight, or a gain below the normal standard, unless supplementary feeding is established. Deterioration may be the forerunner of the cessation of lactation, or well directed treatment may improve the condition of the milk.

Weaning should be done gradually and if possible in cold weather, with no regard to the period of dentition. Any sudden change in food is apt to be followed by indigestion. Sudden weaning may be required in severe acute illness of the mother, but if this is of short duration, it is often wise to keep up the flow of milk by means of the breast pump.

In weaning, the artificial food must be of low strength at first, with a gradual increase in the strength of the milk food. The mother is made more comfortable by a binder holding up the breasts. The management of inflamed breasts and sore nipples is discussed elsewhere.

Mixed feeding is a combination of breast and bottle feeding, and in many cases is superior to artificial feeding alone.

1. The breast milk may be good, but lacking in quantity. 2. It may flow well, but be poor in fat. As regards point 1, we can make the intervals between the nursings longer and feed by bottle once, twice, or three times. As regards point 2, we can endeavor to increase the richness of the breast by a special diet for the mother and feed by the bottle several times a day, and thus continue lactation for a long time. Mixed feeding is often necessary in retarded convalescence after parturition.

No Drugs for Nursing Infants.—The medicinal mismanagement of dyspepsia, or indigestion, in nursing infants is one of the greatest wrongs that a medical adviser can inflict upon the innocent and helpless. Indigestion in nursing infants is managed by diet, abstinence, fresh air, and rectal enemata, and *not by drugs*. The following case from the writer's experience will serve as an illustration for these remarks:

A breast fed infant seven days old had a dyspeptic diarrhœa three days after birth. Instead of cutting off the breast milk for a short time and feeding on farinaceous water, in order to give the gastroenteric tract a chance to readjust itself, the infant was at once drugged according to the prevailing fashion, and calomel, lactopeptine, bismuth, and salol were given in rotation. As there was no improvement, *resorcin* was ordered in quarter grain doses every four hours, and after the sixth dose of this drug the child became cyanotic, pulseless, clammy, and cold, and the urine which had been voided before collapse set in was smoky in color. *Resorcin poisoning* was at once suspected, and the subsequent management was as follows: The child was given a hot bath, 110° F., every two hours and kept warm by hot water packs, the bowels were flushed with a warm saline solution every three hours, and warm sweetened tea was given by a spoon frequently. The child recovered completely in the course of a few days and again took the breast at *regular intervals* and remained well.

FACTS ABOUT MILK

As cow's milk is the basis of artificial infant feeding, its properties and the various methods of its handling and its modification should be thoroughly understood by the practitioner. For that reason some extra space in this volume is devoted to the important subject of milk and milk diluents.

Guaranteed, or certified, milk is pure, clean milk for the nursery as furnished by dairymen under the following safeguards: (1) The veterinary care of the herd and its protection against tuberculosis, sepsis of the udder, and other infectious diseases of the cow herself. (2) The medical care of the attendants in regard to their health, the hygiene of their homes, and the practical quarantine of the farm. The careful sterilization of the milkers' clothing and the cleanliness of their hands and arms during the process of milking. (3) The care of the cows, the absence of manure in the barns, the practical exclusion of fæcal matters from the milk, and precautions against the entrance of dust. (4) The extraordinary precautions placed around the milk in the milk house and in the processes of transportation and delivery.

Standard of Cleanliness

It has seemed wise to establish a standard of cleanliness, or a bacterial standard, to which dealers must conform. The standard prescribed by the commission of the Medical Society of the County of New York, and of the medical commission of the Walker Gordon Milk Laboratory, and of similar commissions in other cities is that the acidity must not be higher than 3 per cent, that the milk must not contain more than 30,000 germs, or bacteria, of any kind per cubic centimetre, and that the butter (fat) must reach 3.5 per cent.

Out of twenty samples examined on a winter day, November 19th, the smallest number of germs found was 90,000, and the highest 2,280,000, while on June 29th, with the thermometer at 90°, out of twenty samples examined, the smallest number found was 240,000, and the highest 516,000,000 per cubic centimetre. The prevalence of bacteria, to a great extent, arises from the dirt of the milk. "There are seven conditions on which the amount of bacteria depends—the cleanliness of the barn, condition of the cow, condition of the milker, condition of the utensils, the cooling process, the transportation, and the cleaning of the milk bottles before they are returned."

Aeration is not a success to-day as used by the ordinary farmer. In good hands it might work all right, but in many cases, as at present used, it results in an increase of germs. The three things which are absolutely necessary to secure milk comparatively free from germs are strict cleanliness, rapid and sufficient cooling, and thorough icing of the milk until it reaches the consumers. In the transportation of milk ordinary freight cars should not be used, and the ends of the cars should be kept closed, thus preventing the heated air from passing through the car and breeding the germs. The railroads could be asked to cooperate and furnish refrigerating cars in which the milk could be kept constantly on ice, and after being unloaded it should be re-iced before reaching the dealers. Milk not coming up to this standard and cheap milk purchased in grocery stores in large cities are absolutely unfit for infant use, and raw milk should not be fed to infants unless it is guaranteed at the above described standard of cleanliness.

Modified Milk; Adapted Milk.—These terms are used in connection with cow's milk which has been modified or adapted by dilution to the needs of the infant. Milk may be modified in the household or may be purchased already modified from the various milk laboratories long since established in all large cities. The laboratory modifications are naturally higher in price than household modifications.

Sterilized and Pasteurized Milk.—During hot weather the infant's food should be Pasteurized—heated to 167° F.—or sterilized—heated to 212° F. The bottles of food may be set in a kettle of water with a thermometer. Heat rapidly to 167° F. and keep the water at this temperature for twenty minutes; then *cool the food rapidly* and *keep it cool.*

Combined Pasteurizers and sterilizers can now be bought with full directions for using. Pasteurizing or sterilizing does not increase the digestibility of the food, but prevents the growth of germs that spoil the food and cause sickness.

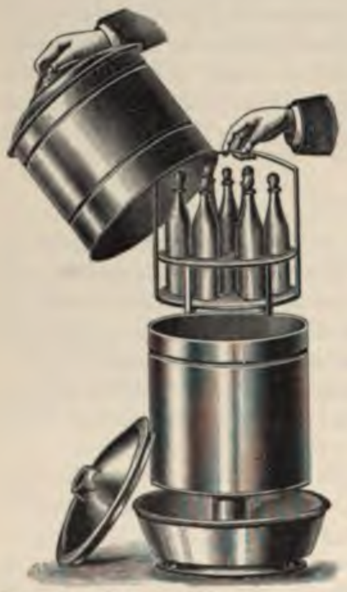


FIG. 47.—ARNOLD STERILIZER AND PASTEURIZER.

Rationale of Milk Sterilization

A few words as to the rationale of milk sterilization. All of our food, liquid or solid, is perishable, and we associate with this process of organic decay the terms fermentation and putrefaction as representing those processes in nature by which organic substances are split up into their elementary constituents, such change being usually accompanied by the formation of poisonous by-products—ptomaines and toxalbumins. In order to hinder a rapid decomposition of our food, we make use of methods of preservation, and employ for that purpose in the laboratory, as well as in the household, the high and low temperature respectively known as the freezing and boiling point of water. Now, one of the most important, and at the same time one of the most unstable, articles of food which enter the household of the rich and poor is cow's milk; and as we know at the present time that spoilt milk is the chief factor in the causation of summer diarrhœa, we have naturally come to the conclusion that the ordinary methods of preserving milk in the household are faulty, especially as regards the manipulation of milk intended for infants' use, and the suggestions of the German chemist, Soxhlet (whose method of sterilizing milk in the household is well known in all civilized countries), have been most enthusiastically accepted and mark a distinct advance in the rational prophylaxis of acute gastrointestinal disease. Since the introduction of Soxhlet's method to the American profession by the writer, in 1887, numerous milk sterilizers have been launched upon the public. The different forms of apparatus now obtainable in this country are all constructed on correct scientific principles, and no special designation need be made in favor of one or the other. The Arnold sterilizers can be used both for Pasteurizing and sterilizing.

One point must be borne in mind, however: there is no apparatus on the market which will make innocuous such milk as already contains the chemical products of decomposition—the ptomaines. The milk which we subject to the sterilizing process should be pure and fresh, otherwise we shall fail in our object. Infant mortality in New York city during the hot weather has markedly decreased since the introduction of the sterilizing process, and depots for the sale of sterilized milk have been established where the poor can obtain such milk for about one cent a feeding.

Sterilizing at a low temperature does not destroy pathogenic germs in milk. The question of the transmissibility of the bovine tubercle bacillus to human beings is, according to Koch's experiments, *sub judice*. The assumption that the sterilizing process is responsible for the condition known as scurvy is erroneous. The Arctic explorer, Dr. Nansen, personally told the author that during his three years' trip not one case of scurvy developed among his men, and he attributed their immunity to the thorough sterilization of all perishable food.

In household sterilization the milk food is steamed in a set of bottles, each containing sufficient food for a single feeding, i. e., enough for twenty-four hours. The rubber stoppers usually furnished with the steamer are to be used only when the milk is to be preserved more than a day or two (on a voyage, for instance). Ordinarily a firm pledget of non-absorbent cotton is twisted into the neck of the bottle before the heat is applied. The bottles are so constructed that they can readily be cleaned; and in feeding, the cotton is removed and an ordinary black rubber nipple is adjusted.

In a recent elaborate report issued by the Wisconsin Agricultural College, steaming for twenty minutes at 140° F. is recommended as a safe procedure for preserving infants' food from day to day. But it must be borne in mind that milk food steamed at a temperature below the boiling point of water (212°) will not keep sweet unless rapidly cooled and kept on ice.

In traveling with infants and young children the ordinary milk obtainable in transit must not be used. An adequate supply of sterilized milk food should be carried along. This can be prepared in the household or secured from a milk laboratory such as those now established in all large cities, or condensed milk or evaporated cream can be carried along and diluted with boiled water (1 to 12).

Pancreatized Milk (*Peptonized Milk*)

This is predigested milk prepared with the aid of a "peptonizing preparation" which is sold in glass tubes, with full directions for its use. In ordinary cases of acute and chronic milk indigestion the writer seldom makes use of pancreatized milk. Its use is indicated occasionally for a week or two in cases of acute febrile illness, when the stomach is so rebellious as to reject almost everything put into it, and it is serviceable for rectal alimentation whenever it is indicated. Peptonized milk has a bitter taste, and children are not fond of it, and it is never indicated as a regular food for healthy children.

Directions for Peptonizing Milk.—COLD PROCESS:

Pancreatin, ... gr. v } make 1 pint.
Sod. bicarb., ... gr. xv }

Mix the sodium bicarbonate and pancreatin in a cup of cold water. Add a pint of cold milk and then shake well and place on ice.

HOT PROCESS.—Prepare as above directed, but place in a dish of water at a temperature of 115°, and keep there for ten minutes. Then place on ice.

Buttermilk.—As nourishment in subacute and chronic diarrhœal disease of infants buttermilk has been recommended by Dutch physicians. Some very satisfactory results following its use in older children and convalescent adults have been observed.

Condensed Milk and Evaporated Cream.—Milk kept in grocery stores is unfit for infants' use. When parents are unable to buy pure certified milk or are not intelligent enough or willing to handle it properly, fresh condensed milk may be fed. It must be diluted with boiled water or barley water or oatmeal water in the following proportions: 1 to 12 for the first month; 1 to 10 for the third month; 1 to 8 for the sixth month.

If fresh condensed milk is used, sugar and cream must be added. Canned condensed milk is sufficiently sweet and does not require additional sugar. Condensed milk sufficiently diluted to bring down the percentage of casein to the breast milk standard will require the addition of cream or fat. Evaporated cream in cans may be used for this purpose. Each feeding should be separately prepared. Feeding on condensed milk is not expensive and is simple as regards its preparation, but the results are not so satisfactory as with fresh and pure cow's milk.

Asses' and Goat's Milk for Infant Food.—Feeding with asses' milk has given good results, and is frequently employed in France. Children take about one quart of milk a day. Asses' milk comes nearer to human milk than any other, but contains a low percentage of fat (one half of 1 per cent), and is not adapted for more than the first two months of infancy. Goat's milk contains a high percentage of fat. A goat furnishes from two to three quarts of milk daily. The milk has a peculiar animal taste unless the goat is stall fed.

DILUENTS OF COW'S MILK

Boiled Water; Farinaceous Water; Whey.—When raw cow's milk is to be fed, the author prefers giving boiled water as a diluent up to three months. When sterilized or Pasteurized cow's milk is to be fed, the writer's experience is in accord with the teachings of A. Jacobi, who says:

"The barley and oatmeal are the two substances I mostly employ, as their chemical constituents are nearly alike, with the exception of a large portion of fat in oatmeal, which is not found in barley. Barley water or thinned and sweetened oatmeal may be given to the child even at the breast. The indications for the use of one or other lie in the condition of the infant. Where there is a decided tendency to constipation, I prefer oatmeal; where there is no such tendency, as usual, or perhaps even a tendency of the bowels to be loose, I employ barley."

If whole cereals are used instead of flour, two to four tablespoonfuls to a quart must be taken (with some salt), and cooked for one to two hours. An equal part of top milk is added to such a decoction and some cane sugar. (See article on Home Modification of Cow's Milk.) The mixture, when fed, should have a temperature of 80° to 90° F. *Whey*, deprived of its fat, has been suggested as a diluent of cow's milk.

Dextrinized Gruels.—In exceptional and selected cases more satisfactory results are obtained if the gruel which is used to dilute or modify the cow's milk is dextrinized by means of malt diastase or cereo.

Whey.—In case of inability to digest the casein of cow's milk, or an idiosyncrasy toward milk, the milk can be curdled with rennet or pepsin, and the curd removed.

Whey contains {
1 per cent of fat.
1 per cent of lactalbumin.
4 per cent of sugar.

In feeding with whey, sugar and cream must be added to make up for the deficiency of both in the whey.

PRESCRIPTION BLANK FOR MILK FOOD

	PER CENT.		REMARKS.
℞ Fat			Number of feedings..............................
Milk sugar			Amount at each feeding..........................
Albuminoids			
Mineral matter			Infant's age ....
Total solids			Infant's weight ....
Water			Alkalinity..........................%
	100	00	Heat at............................°F

Ordered for...

....

Date, ...	Signature, ...

MILK LABORATORIES AND PRESCRIPTION WRITING FOR MILK FOOD

Through the efforts of Dr. T. Rotch, of Boston, and the Walker-Gordon Company, milk laboratories have been established in our large cities in connection with model dairies. They furnish pure, clean milk and cream of full strength or modified. Milk food is delivered in bulk or in bottles containing a single feeding, according to the physician's order or prescription. The price for a day's rations of modified milk varies from 30 to 80 cents. Clean milk is delivered for 15 cents a quart. This plan has advanced the knowledge of infant feeding, has made it possible for parents to obtain clean milk for their children, and is a great convenience in cases in which home modification of cow's milk cannot properly be carried out.

Babcock Milk Tester

Several methods of rapidly determining the amount of fat contained in milk with the aid of chemical reagents have been devised. One of the most accurate is the Babcock milk test. The little machine constructed to apply this test, of which several patterns are made, is in use in almost all well conducted milk receiving stations. It requires about a tablespoonful of milk for a sample, and the exact percentage of fat in it can be determined by this test in ten or fifteen minutes. The result is obtained by the

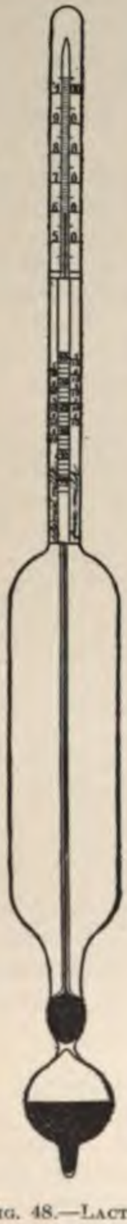


Fig. 48.—Lactometer.

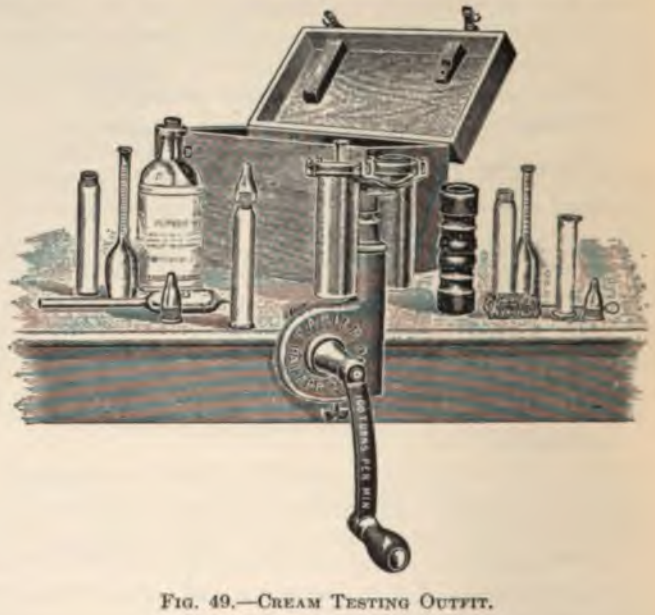


Fig. 49.—Cream Testing Outfit.

action of centrifugal force combined with some chemical effects. The original cost of the machine is from $3 to $15, according to size and pattern, and a few cents' worth of materials are used at each operation. Its manipulation is easily learned, and it can be successfully operated by any careful person by following the directions which come with the apparatus.

COW'S MILK FOR INFANT FEEDING

Our principal aim is to take the composition of mother's milk as a standard, and to adjust cow's milk in accordance with this standard, cow's milk being the most available substitute for mother's milk which we have.

	Fat.	Sugar.	Proteids.
Human milk	4.00	7.00	1.50
Cow's milk	4.00	4.00	4.00

Modification of cow's milk is accomplished by reducing the proportion of proteids by dilution; by increasing the quantity of fat originally sufficient, but made insufficient in amount by the necessary dilution; by increasing the sugar and salt made insufficient in amount by the necessary dilution.

The manipulations necessary to modify or adapt cow's milk for infants can be carried out in the household or in milk laboratories. The introduction of percentage feeding has placed infant dietetics on a scientific basis and has given us milk laboratories, but success in infant feeding is not a matter of accurate percentages—as the general practitioner has erroneously inferred. Milk food ordered by prescription according to the percentage method and supplied by the laboratory has given very excellent results, but we may obtain the same gratifying results by home modifications, by simple dilutions, in which the principle of percentage feeding is carried out in a simple way.

For various reasons modifications of cow's milk, whether done in the household or in the laboratory, will not give uniform good results in difficult feeding cases, no matter how accurate we are in our manipulation of percentages. The chemistry of digestion is very complex, and the alimentary canal is not a test tube. The behavior of food in an infected intestine or feeble organism is often difficult to understand, and thus our best efforts will have their limitations. Success in feeding will not come to us with mathematical certainty. Minute differences in the composition of the proteids of cow's milk as compared with human milk have a theoretical but no practical interest. Suggestions for modifying cow's milk which take into consideration the minute differences in chemical composition are thrown to the winds. We *cannot* convert cow's milk into mother's milk, no matter how scientific we are. We are obliged to use cow's milk as Nature furnishes it, and *without proper hygienic* management neither home nor laboratory modification of cow's milk will fit the baby with a capricious digestion. *With proper hygienic management*, however, clean cow's milk, properly diluted or modified, will fit the vast majority of infants.

In the home modification of cow's milk, the greatest simplicity is desirable for all concerned. *Simple dilution of top milk* with water or farinaceous water will answer in the vast majority of cases, if the deficiency of sugar and salt is made up by adding these substances to the diluted top milk.

The following simple method of home modification has been practised by the writer for the past twenty years: If a quart bottle of average good milk stands four hours, the upper half of the milk will contain about twice as much fat as the milk before standing. *This pint of so called top milk* is decanted or dipped out by means of the Chapin dipper and forms the basis of bottle food for home modification. By diluting this *pint of top milk* in various proportions, viz.: 1–1, 1–2, 1–3, 1–4, 1–5, we obtain a food of various strengths as regards fat and proteids. The deficiency of salt and sugar is readily made up by the addition of these substances, and a food can thus be prepared which will vary in composition according to the requirements of the child to be fed. The cost of a daily feeding with the best milk obtainable is about twenty cents a day.

When clean milk can be had, the milk may be given raw. In hot weather and with the average milk supply the food must be sterilized. As an additional precaution the top milk may be filtered through a layer of cotton in a funnel.

SCHEDULE OF HOME MODIFICATION OF COW'S MILK

	No. 1 (1–4).	No. 2 (1–3).	No. 3 (1–2).	No. 4 (1–1).
Cane sugar	2 ounces	1½ ounces	1¼ ounces	1 ounce
Table salt	35 grains	30 grains	25 grains	20 grains
Diluent	26 ounces	24 ounces	20 ounces	15 ounces
Top milk	6 ounces	8 ounces	10 ounces	15 ounces

The diluent may be boiled water, oatmeal or barley water, or whey.

No. 1.—For young infants (one month) and difficult feeding cases. Feed 1 to 2 oz. every two hours (twice at night).

No. 2.—Adapted for young infants with good digestion or for infants two to three months old. Feed 2 to 3 oz. every two hours (twice at night).

No. 3.—Adapted for infants of from four to eight months. Feed 4 to 6 oz. every two and a half to three hours, eight feedings in twenty-four hours (once at night).

After the eighth month give six bottles and two feedings of cornstarch pap with egg, or mutton or beef broth with rice or sago, tapioca, or pea soup.

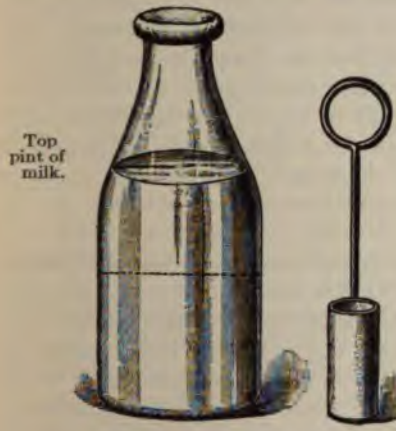
No. 4.—Rich milk adapted for children over one year old. Give five bottles, 6 to 8 oz. each, and two additional feedings as above mentioned.

Pour the mixture into small nursing bottles, each to contain one feeding, and cork with a pledget of clean cotton and sterilize in warm weather. Sterilized milk keeps without ice. Keep raw and Pasteurized milk food on ice. Before feeding, heat to the body temperature by placing the bottle in hot water. Then remove the cotton and feed by means of a rubber nipple.

This method of modifying cow's milk does away with the addition of separated cream and is a distinct advantage over the so called cream mixture, because separated cream, having a high market value, is not invariably fresh, has not a uniform composition, and is very prone to spoil and give rise to dyspeptic diarrhœas and symptoms of milk poisoning in general.

Cow's milk modified in the household according to this simple method will agree with the vast majority of infants. In a difficult feeding case it is best to stop feeding milk for a few days and begin again with a low strength modified milk and gradually work up. When we encounter a positive idiosyncrasy for cow's milk we may be compelled to make use of some other foods. An idiosyncrasy for cow's milk in proper dilution should not be suspected *until after the children have had proper hygienic management to help them digest their milk.*

Infants and children who are kept indoors in cool and cold weather, and breathe the air of overheated and stuffy living apartments, will not digest well, no matter what they feed on. It should be made a practice to send infants out of doors from the time that they are six weeks old. The insane fear of breathing cool fresh air is almost as pronounced to-day as it was in times before the advent of the germ theory of disease, and is responsible for most of the indigestion among children. A move in the right direction as regards the hygienic management of infants and children has been started in Boston by some of the wealthy families in the Back Bay district, who put their babies to sleep in a box on the flat roof or on a balcony or window sill, summer and winter. The method is begun when the baby is two months old, and may be continued as long as the custom of having a daily nap is kept up.


Top pint of milk.

Chapin dipper.

Fig. 50.

Fig. 51.—Seibert's Aluminum Milk-Filter, with Cotton Disk.

The baby is wrapped like an Indian papoose and strapped to the box or basket in such a way as to give freedom to the feet and arms and yet make it impossible for the child to crawl out. The crib is shielded from the wind and direct sun rays by an awning overhead. If the outdoor treatment is carried out, drugs and digestive ferments and the peptonizing process are hardly ever indicated.

To sum up, I would say that there are no universal rules for feeding cow's milk. What we must aim at is to individualize in each and every case, and not attempt to adapt one form of feeding to all cases and under all conditions. In a difficult feeding case cow's milk should be discontinued for a short time and cereal decoction and white of egg, etc., substituted. In resuming cow's milk we begin with a low strength and gradually work up to full strength milk and avoid overfeeding. Digestion of cow's milk is best stimulated by carrying children out of doors, not by drugging. Digestive ferments and peptonized milk are rarely indicated.

Idiosyncrasy for cow's milk is managed by selecting some substitute food, if possible the breast of a wet nurse. In some cases whey with cream and cereal decoction will fit the baby. The whey proteids differ as to digestibility from the casein.

Cow's milk should be sterilized (steamed) in warm weather. The preservation of cow's milk by means of a harmless chemical is a desideratum; because the heating process slightly alters the digestibility of cow's milk. Behring has suggested the use of formaldehyde for preparing a permanent milk (1 to 10,000). Infants will usually thrive on properly modified cow's milk up to seven months. After the seventh or eighth month they are apt to become rhachitic unless they receive beef or mutton broth, with cereals and egg, in addition to cow's milk. With proper hygienic management to stimulate the motor function of the gastroenteric tract, we may let the secretions take care of themselves.

How to Feed.—Select round, wide mouthed, graduated nursing bottle, and use black rubber nipples. Hold the bottle upside down and see that the hole in the nipple is large enough to allow the food to drop slowly, not run in a stream. Heat the food by placing the bottle in warm water for a few minutes, or heat the contents of the bottle in a dipper over a fire and return to the same bottle. Shake the bottle before feeding. Never warm any food that may be left in the bottle. Throw it away. Never give anything but cool water that has been boiled, between meals. As a rule, children do not get enough water.

Care of Nursing Bottles.—After feeding, rinse the bottle with cold water, and then wash with hot solution of borax (one teaspoonful to a quart) and a bottle brush. When the bottle is not in use, keep it full of water and the nipple lying in water in which a little borax has been dissolved. Before using the bottles, scald them with boiling water.

Raw milk should be fed only during the cold months. As soon as warm weather sets in the bottle food (milk food) must be sterilized or Pasteurized.

Strength of Milk Food.—In ordering milk for an infant, not only its age but its weight must be taken into account. There are some cases where the strength of the milk food may be increased rapidly. Usually it is best to begin with low strength milk food and gradually increase as the child gets older and heavier. The critical time in infant feeding is the first two months, and the difficult feeding cases are those in which infants have made a bad start.

It must be distinctly understood that there are no set formulæ for the various ages and weights of infants. The digestive capacity for food and food components—fats, proteids, and cereals—is different in various individuals and at various periods. It is lessened in hot weather and illness, and increased in cold weather. A steady increase in weight and the appearance of two gamboge yellow stools a day are the best indications of good feeding. The strength of the food may be modified once a month to suit the condition of the child.

TABLE FOR THE FEEDING OF THE HEALTHY INFANT DURING THE FIRST YEAR

AGES.	Number of feedings within 24 hours.	Quantity for each feeding.	PERCENTAGES OF		
			Fat.	Sugar of milk.	Proteids.
1st week	10	½–1 oz. 15– 30 cc	2.	5.	0.50
2d week	10	1 –1½ oz. 30– 45 cc	2.25	5–6	0.50–0.75
3d–4th week	10–9	1½–2 oz. 45– 60 cc	2.50	6.	0.75–0.90
4th–6th week	9–8	2 –2½ oz. 60– 75 cc	3.	6–6.50	0.90–1.
6th–8th week	9–8	2½–3 oz. 75– 90 cc	3.	6.50	1.00–1.25
3d month	8	3–4 oz. 90–120 cc	3.	7.	1.25–1.50
4th month	8–7	4–5 oz. 120–150 cc	3.50	7.	1.50–1.75
5th month	8–7	5–6 oz. 150–180 cc	3.50	7.	1.75
6th–7th month	7	6–7 oz. 180–210 cc	4.	7.	1.75–2.
8th–9th month	7–6	7–8 oz. 210–240 cc	4.	7–6	2.00–2.50
10th–12th month	7–6	8 oz. 240 cc	4.	5.	2.50–3.50

Indications for Varying the Percentage of Fat, Sugar, and Proteids for Healthy Infants.—The exact indications for varying the percentage of fat, sugar, and proteids in cow's milk cannot be given in the present state of our knowledge. An excess of sugar usually gives colic, thin, green, acid stools, causing eructation of gas from the stomach and some regurgitation and frequent passages of nearly normal appearance; in some cases round masses of fat are passed. Too little fat shows constipation and dry hard stools (also observed in children who get sufficient fat). The writer has rarely ordered milk food with more than 4 per cent of fat.

An indication of excess in proteids, or imperfect digestion of proteids, are the curds in the stool and colic, sometimes with constipation or diarrhœa or vomiting and regurgitation. Imperfect digestion of proteids or fat from lack of fresh air, from keeping children in overheated, close rooms, causes nearly the same symptoms as indigestion from other causes. It is therefore unwise to modify the milk so as to meet every temporary symptom of discomfort in the infant, but we should try the fresh air plan first, then reduce amount of feeding and finally modify the milk or food. If the symptoms persist, it will be necessary to cleanse the gastroenteric tract by means of a dose of oil, rhubarb and soda, or calomel, and give farinaceous water and white of egg for a few days and then return to a bottle food of less strength, which is more apt to be digested. For infants who are unable to assimilate the milk dilutions here recommended it is best to procure a wet nurse without much loss of time. The management of difficult feeding cases is discussed elsewhere. Premature infants, if deprived of breast milk, are fed on low strength food by means of a medicine dropper. They take from a drachm to an ounce about every two hours, and should be fed slowly.

DIET FOR CHILDREN AFTER WEANING OR DURING THE SECOND YEAR OF BOTTLE FEEDING AND AFTER THREE YEARS

MILK.—Full or of half strength—sterilized or Pasteurized in summer.

CEREALS.—Oatmeal, farina, hominy, etc., well cooked. Cracked oats, cream of wheat, Pettijohn, rice, force, with salt, sugar, or cinnamon, with and without fresh cream or top milk.

TOAST, milk toast, zwieback, crackers, sweet crackers, bread and butter.

MEAT broth, soups with cereals, with egg, with toast; eggs, scrambled, custard. After eighteen months give minced meat. *Water boiled and cooled.*

Diet for Children from Two to Three Years Old.—Add mutton chops. rare beef, soft boiled eggs, baked apples, stewed prunes, and orange juice,

Diet after Three Years.—

SOUPS.—Plain soups and broths of nearly any kind.

EGGS.—In any form, soft boiled, omelette, scrambled, poached, or beaten in milk.

MEATS.—Beef, beefsteak, lamb, mutton, lamb chops, chicken, and turkey, broiled, roasted, or boiled.

FISH.—Any kind, boiled or broiled.

VEGETABLES.—Peas, beans, spinach, lettuce, potatoes, tomatoes, asparagus tips, stewed celery.

CEREALS.—Oatmeal, rice, hominy, wheat, barley, corn meal, wheat and graham bread, toast, zwieback, oatmeal, soda and water crackers, macaroni, etc.

FRUITS.—Nearly all stewed or sweetened, peaches, pears, plums, oranges.

DESSERT.—Light puddings, custards, jellies, ice cream, honey, chocolate. (Most of the jams in the shops are artificial or adulterated.)

Young children should be fed five times a day; they usually take from two to three pints of fluid food; some children will be hungry at all times and others have a capricious appetite. The nibbling of food between meals destroys the appetite. No food will agree unless the children exercise. The craving of children for sweets should not be entirely ignored. School children should have a short vacation at reasonable intervals or as soon as they show marked fatigue. Children's digestion suffers but little from romping after a meal.

DISORDERS OF THE DIGESTIVE TRACT

GENERAL REMARKS

This group of ailments is intimately connected with the various problems in infant feeding and oral and general hygiene. A clear understanding of such a relationship is a valuable accomplishment in the family practitioner. To look upon acute inflammatory diarrhœa as due to bacterial invasion and *largely preventable* marks a great advance in pædiatric practice as compared with our former views on the ætiology of diarrhœal disorders, which centred in worms, teething, and "catching cold." To make a physiological process like dentition responsible for innumerable ills and sins is certainly convenient and about as rational as to assume that the growth of hair or nails bears a causal relation to parasitic and other skin disease.

Admitting that teething in some infants may cause pain, it is best to ignore dentition as an ætiological factor in sickness, and thus attempt to eradicate a popular superstition which has at all times worked untold harm. Let it be understood by mothers and nurses that the second summer diarrhœas have a causal relation to *a change in feeding* or to *faulty feeding, not to dentition*, and that the treatment is dietetic and hygienic, *not* medicinal. Cases of primary inanition from too little food (such as scanty breast milk) are not apt to occur in bottle fed children. On the other hand, indigestion and dyspepsia or fermentative diarrhœa are not rare in breast fed infants from overfeeding or poor breast milk. In bottle fed children, however, and particularly in hot weather, diarrhœal disease is an every day occurrence.

Spoilt food, overfeeding, faulty hygiene, and weak digestive powers are provocative of indigestion, and lead to temporary or prolonged malnutrition. The so called difficult feeding cases frequently develop into inflammatory diarrhœas of severe type or lead to the various forms of malnutrition and intestinal toxæmia, such as *atrophy, rhachitis*, and *scurvy*. From the mild to the severe forms we have one chain of pathological conditions. Thus the timely treatment of a mild form of diarrhœa may prevent a dangerous cholera infantum, etc.

After indigestion has persisted for a time, atony and dilation of the stomach result. In the more active inflammatory diarrhœas structural changes in the intestinal mucosa are found, and frequently grave complications follow such structural changes.

Renal Complications of Acute Enteric Disorders.—Degenerative changes in the kidneys occur in many cases of prolonged intestinal indigestion and inflammatory diarrhœas, due to the action of bacteria and toxines. In such cases albumin and renal elements are found in the urine. When found in cases of infantile atrophy they are of grave prognostic import.

Regarding the *nomenclature* of gastrointestinal disorders, it may be remarked that in the present state of our knowledge a purely anatomical or purely microbial nomenclature of diarrhœal diseases is impossible. A simple diarrhœa may be of nervous or psychic origin or may be due to overfeeding and food fermentation, during which substances are formed which have a laxative action or a toxic action (milk poisoning), or diarrhœa may be symptomatic, as in the course of infectious and organic disease. The catarrhal or inflammatory diarrhœas are all due to microbial invasion of the intestine itself. Acute gastroenteritis and enterocolitis in children are evidence of such local infection. The mild forms may terminate in severe forms. The *Bacillus dysenteriæ* described by Shiga in 1898 seems to bear some ætiological relation to the diarrhœas of infancy, and has been found in the mild inflammatory forms as well as in the severe forms in breast fed and bottle fed children. The results of the treatment with antidysenteric serum have so far been disappointing. All inflammatory diarrhœas are communicable. The hand that attends to the toilet of a sick child should not feed the well children.

AILMENTS OF THE MOUTH IN CHILDREN

Slobbering of Infants.—This manifestation, which is aptly enough described by the name accorded it, is not of infrequent occurrence in early infancy and during the period of active dentition. Though frequently ascribed to local irritation, difficult dentition, and uncleanliness, it is not necessarily so caused, and is often met with in idiots, epileptics, and the morally and physically degenerate.

Bleeding of the Gums.—Independently of the acute inflammatory affections of the gums, bleeding is observed in scurvy. (See Scurvy.) When the bleeding does not respond to simple methods, prolonged pressure over the bleeding spot with a pledget of cotton saturated with alum solution, or a 10 per cent antipyrine solution or adrenalin solution, or the actual cautery may be applied.

Stomatitis Catarrhalis.—This form of inflammation is usually of a mild type, runs an acute course terminating in about a week, and is not associated with pronounced constitutional symptoms. It is generally observed during infancy and is caused by the introduction of irritating and unclean substances into the mouth (e. g., dirty fingers, unclean nipples). It may be concomitant with or secondary to the exanthemata and to gastrointestinal affections. The symptoms are mild. There is some rise in temperature; the mouth at first is red, dry, and hot. Thirst, pain, and irritability are present. Later the mouth becomes moist and there is increased salivation. The changes in the mucous membrane consist simply of local hyperæmia, increased epithelial proliferation, and subsequent desquamation with little or no tendency to ulceration.

The TREATMENT of this affection consists in keeping the mouth clean with a 2 per cent boric acid solution or a mild solution of borax in water and glycerin. Should constipation exist, a mild laxatixe may be given.

Stomatitis Follicularis (Aphthous, or Vesicular, Form).—This is of severer type and longer duration than the simple catarrhal form. The local tissue changes are more marked and the constitutional disturbance is more pronounced. Causative agents are any of the severer constitutional diseases, a deteriorated state of health, malnutrition, and unhygienic conditions and surroundings. The change observed in the mucous membrane consists in the appearance of vesicles which ulcerate and have swollen, well defined, grayish yellow denuded surfaces. The affection is in many instances so painful that the child refuses nourishment.

TREATMENT.—A pale rose colored solution of potassium permanganate or boric acid, 6 parts; salicylic acid, 1 part; water, 500 parts, or alum water (a teaspoonful to the pint), should be used as a mouth wash and gargle. The mouth may be swabbed frequently with cotton pledgets moistened with one of the solutions. Other agents which may be employed are:

$$\left.\begin{array}{ll}\text{Tannic acid,} \ldots\ldots & ʒj \\ \text{Glycerin,} \ldots\ldots\ldots & ℥j\end{array}\right\} \text{30 drops to a pint of water.}$$

Or Labarraque's solution in water, 1 part to 20.

Croupous or Membranous Stomatitis.—Abrasions, wounds, and inflammatory lesions in the mouth or nasopharynx are frequently found to be covered with a yellow pseudomembrane, which may be diphtheritic or non-diphtheritic. This occurs frequently as a complication of the eruptive fevers and whooping cough and following operations in the mouth or on the tonsils. From the mouth it may spread to the nasopharynx and larynx. When it invades the latter, it may manifest itself as membranous croup, and in this respect the significance of membranous stomatitis is underestimated in general practice. A culture from the mouth will reveal the presence or absence of diphtheria bacilli. When they are present, 1,000 to 2,000 units of antitoxine should be injected in the usual way in order to prevent further systemic infection. The local treatment is the same as for ordinary forms of stomatitis.

Thrush, or *Muguet*, frequently termed *Sprue* (*Mycetogenetic Stomatitis*), is a form of stomatitis caused by the organism termed *Oidium Albicans*. On the tongue or buccal mucosa numerous small white pellicles appear, frequently coalescing and invading the epithelial and mucous surfaces. The disease is of very frequent occurrence in young infants and is probably caused by local uncleanliness. Soiled nipples, dirty stoppers and bottles, and dirty clothes are agents which carry the infection to the mouth. Poorly nourished and delicate children are the frequent subjects of thrush. Its distinguishing features are the small white flakes resembling coagulated milk. On attempting to forcibly swab these particles away, small bleeding points appear at their site. Microscopical examination of the deposit shows the organism.

TREATMENT.—The mouth should be gently wiped out with a borax or bicarbonate of sodium solution before and after each feeding, and everything that is carried into the mouth should be clean.

Tongue tie is due to a short frenum, and in consequence protrusion of the tongue is interfered with, sucking is embarrassed, and the condition if not remedied, will eventually interfere with distinct articulation. To remedy the deformity, the frenum is "nitched" with small scissors in a direction downward and backward to avoid the ranine artery, which lies in the fold of the frenum, running up along the base of the tongue.

Tongue Swallowing.—Asphyxia from swallowing the tongue, owing to its riding over and shutting off the opening of the glottis, is occasionally observed. The tongue is drawn back and down over the glottis by the muscles of deglutition, and this is due to congenitally long or large tongue or lax frenum. This condition calls for immediate relief. The tip of the tongue may be caught up by the finger, forceps, or suture and drawn forward whenever the danger of asphyxia threatens.

Strawberry Tongue.—This name is given to a bright red appearance of the anterior part of the tongue with the filiform papillæ glistening through the mucous lingual surface. This condition is typical of scarlet fever in the early stage of the disease.

Geographic Tongue.—This is occasioned by local desquamation of the lingual epithelium in patches. The bases of the patches are red and of irregular maplike shape, hence the term geographic. This condition is of parasitic origin and may last for months. Special treatment is unnecessary.

Dental Ulceration (Riga's Disease).—The presence of carious teeth in the mouth and prolonged friction of the tongue or frenum against the teeth are causes. As a rule, touching the base of the ulcer a few times with a 5 per cent nitrate of silver solution suffices to cure. Decayed teeth should be extracted or filled.

Sublingual Ulcer.—This is frequently met with in children suffering from whooping cough; the ulcer presents itself where the frenum is in contact with the incisor teeth.

The TREATMENT resolves itself into cleansing the ulcer and occasionally touching it with lunar caustic to encourage healthy granulation and repair.

Sublingual Granulation Tumor.—This may be removed by scissors or scraped away with a spoon or cauterized with lunar caustic. The mouth must be kept clean by means of mild antiseptic solutions.

Herpes of the Lips.—Herpes blisters develop on the lips in the course of febrile disease. Camphor ice acts admirably as a soothing application.

Perlesche starts at the angle of the mouth as a small fissure and spreads as an ulcer covered with a grayish exudate.

The TREATMENT is cleanliness, cauterization with nitrate of silver, and protecting with camphor ice.

Cracks and Fissures of the Lips.—This condition requires stretching of the lip and the application of nitrate of silver and camphor ice.

Eczema of the lips yields to mild protecting ointments.

Sordes.—A brown coating of the lips in febrile disease. The treatment consists in washing and applying camphor ice.

Protruding Tongue of Cretins.—(See Cretins.) All other conditions of the mouth and tongue are discussed in the chapter on Diseases of the Mouth.

MUMPS; PAROTITIS

An infection of the parotid or other salivary glands, characterized by a swelling of the gland or glands and mild constitutional symptoms. Infants are rarely afflicted; most cases occur in children between three and fourteen.

The epidemic parotitis is contagious and therefore of microbial origin. The contagium has not been isolated. The portal of entrance is probably the buccal cavity; therefore hygiene of the mouth is the best preventive. Three weeks after the termination of a case the danger of infecting others is probably over.

Symptoms and Differential Diagnosis.—Malaise, fever (101° to 103°), headache, vomiting, pain in the angle of the jaw, localized swelling on *one* or *both* sides, a disagreeable pressure sensation, and dryness. Chewing and speaking are painful and difficult. The swelling disappears after from eight to ten days.

Mumps may be confounded with acute swelling of the central lymph nodes. In mumps the lobe of the ear is near the centre of the enlargement. The enlarged lymph nodes are behind the ear and behind the jaw, never upon the face. The swollen neck, as observed in some cases of tonsillitis, diphtheria, or scarlatina or measles with throat complications, should not been mistaken for mumps. On the other hand, inflammation and suppuration of the parotid gland may complicate an infectious disease, as in typhoid fever and various forms of sepsis and by extension in otitis media.

Treatment.—Unless the symptoms are severe, the patient may be up and about in fresh air. The diet should be restricted and the bowels opened by from three to five grains each of calomel and jalap. The nasopharyngeal toilet with salt water should be employed, and antiseptic gargles and mouth washes are indicated. If the symptoms are severe, the patient is put to bed on fever diet. Ichthyol vaseline (3 per cent) or camphorated oil may be gently rubbed over the painful swelling, and an ice bag or hot water bag may be applied. A sympathetic swelling of the other glandular organs (orchitis, mastitis, ophoritis) and of the joints usually subsides with the parotitis. Otitis media and deafness, and meningitis by extension, are rare sequelæ. In suppuration of the gland incision and drainage are indicated. *Prognosis is favorable.*

INDIGESTION AND DIARRHŒAL DISORDERS

HABITUAL CONSTIPATION AND DIFFICULTIES OF DEFÆCATION IN INFANTS

Straining at stool and constipation are found in infants principally under the following conditions: Weak peristalsis from lack of muscular development in the rectum and difficulty of overcoming resistance at the rectal valve, as in congenital and acquired rickets; low percentage of fat and of total solids in the food; fissures at the anus, giving pain in defæcation: chronic intestinal indigestion with constipation and "putty stools"; opium preparations given secretly to quiet the child.

A weak peristalsis will ultimately be overcome by the process of development, and forcible dilatation of the sphincter is readily performed. *Fissures* require dilatation of the sphincter and cauterization with a 2 per cent nitrate of silver solution.

Aside from the selection of the proper diet in *rhachitic infants* we may aid nature in overcoming constipation by increasing the fat and solids in the food; administering fruit juices (prune juice) and Vichy water or sulphate of sodium (10 grs.); administering soap suds enemata or soap suppositories; gentle massage of the abdomen and vibratory massage; keeping children out of doors all day. (See also general article on Constipation.)

COLIC AND VOMITING

Colic.—The distention due to the formation of gases in the intestines is probably the cause of pain. Bottle fed children are very apt to suffer from this condition, which is a *strong indication for reducing the strength of the food.* An attack of colic is treated by giving a warm soap suds enema, a warm bath of 95° F., and warm fennel or mint tea to drink. Opium is rarely necessary. The relief which follows these measures will enable the physician to exclude intestinal obstruction or appendicitis. It should be borne in mind that small *umbilical hernias* are sometimes responsible for recurring attacks of colic, also *renal gravel.*

Simple Vomiting.—Frequent vomiting is a very annoying symptom, and food is rejected very soon after it is taken into the stomach. Should *fresh air treatment* and a *reduction of the food strength* not give satisfactory results the following prescription may be offered:

℞ Tinct. iodini,	gtt. x;
Aq. menth. pip.,	ʒvj;
Syrupi sacchari,	ʒij.

M. et signa: A teaspoonful every hour or two.

Habitual vomiting may often be overcome if the children are fed by gavage. (See General Therapeutics.) Persistent vomiting and rapid emaciation in the new-born are suggestive of *pyloric stenosis*.

Recurrent Vomiting; Cyclic Vomiting.—Obstinate and repeated vomiting is the most striking symptom, coupled with thirst, a bad odor from the mouth, emaciation, and exhaustion. The attack may last from one half to fourteen days and is looked upon as a toxic neurosis. *A differential diagnosis must* be made between *periodic vomiting*, vomiting in *acute infectious disease*, in *acute indigestion*, in *intestinal obstruction*, and in *meningitis*.

Recurrent vomiting is autotoxic in origin and characterized by repeated attacks of nausea, persistent vomiting, and great prostration. The great majority of cases occur during infancy and childhood. Heredity is the most important predisposing factor. A general neurotic inheritance is common. Nearly all of these patients are constipated, and this condition is doubtless an important ætiological factor. Overeating is a very potent factor. Warning symptoms are flushings of the cheek, coryza, general restlessness, nervous irritability, sleeplessness, sallowness of the complexion, dark rings under the eyes, general malaise, constipation, and loss of appetite. Vomiting follows the prodromes in from six to forty-eight hours. After an attack the stomach, as a rule, resumes its functions. Thirst is a striking symptom. Emaciation is extreme in long continued cases. Gastric pain is not present in these attacks in children. Nervousness is very marked. The urine is very concentrated. The prognosis in relation to recovery is good.

TREATMENT OF RECURRENT VOMITING.—The sources of reflex irritation should be sought for and removed, if possible.

Diet.—Reduction of food strength.

Fresh Air.—Six to eight hours out of doors daily.

Enteroclysis.—Daily. (See General Therapeutics.)

Tincture of iodine internally in drop doses every hour in sugar water during the attack.

Stomach washing in severe cases. In the interval apply hydrotherapeutic measures and abdominal massage.

ACUTE INDIGESTION

Mild Form Acute Dyspepsia, Gastricismus.—This is due to dietetic imprudence, overfeeding at the breast or by the bottle, and unsuitable, irritating, or decomposing food.

SYMPTOMS.—Eructation, nausea, vomiting, coated tongue, loss of appetite, thirst, usually no fever. There may be constipation or diarrhœa and evidence of dull pain.

PRINCIPLES OF TREATMENT.—Relieve the gastroenteric tract; restrict food (no food for six to twelve hours); quench thirst by giving water or tea or toast water; give cool sponge baths in warm weather; carry the child into the open air.

If vomiting and diarrhœa coexist, the stomach and intestine will soon be relieved. If not, advise a dose of castor oil or calomel (six half grain doses with sugar should be given every half hour) and plenty of boiled cool water or toast water to quench thirst. If the tongue remains coated twenty-four hours after the bowels have moved, the following prescription will aid digestion and may be given to children over one year old:

℞ Acid. hydrochloric, dil.,.................. gtt. x;
Ess. pepsin.,............................ ʒj.

A teaspoonful after feeding.

A dyspeptic attack requires no other medication.

Milk should not be given for a day or two; farinaceous or mucilaginous drinks may be given instead.

SUBSTITUTE DIET in Indigestion and Diarrhœa when milk is contra-indicated:

Young Infants.	*Older Children.*
Oatmeal water.	Cornstarch pap.
Barley water.	Burnt flour soup.
Rice water.	Farina.
Gum arabic water.	Beef broth.
Peppermint tea.	Mutton broth.
Toast water.	Bouillon and egg.
White of egg and water.	

As soon as the dyspeptic symptoms have ceased, we return to breast feeding (if not otherwise contraindicated) or to the proper bottle food, with a caution not to overfeed.

ACUTE CATARRHAL GASTRITIS IN INFANTS

Severe Type.—Infants at the breast or on the bottle frequently become acutely ill with high fever (105° to 106°), rapid pulse and rapid breathing, great unrest, twitching or convulsions, and vomiting with and without diarrhœa. These symptoms are sometimes quite alarming, and are due to *acute milk poisoning with gastric irritation.* They very much resemble the sudden onset of other acute infectious diseases. In the absence of *throat symptoms* and *meningeal symptoms,* the true nature of the onset will be recognized by the experienced practitioner.

MANAGEMENT.—Stop feeding milk; give farinaceous drinks only; give a warm bath (95° F.); give a warm soap suds enema. In the way of medication, four to six half grain doses of calomel may be given, one every hour. The temperature usually drops to the normal in twelve to twenty-four hours, after which it will be safe to give the breast at proper intervals.

Bottle fed babies should receive, for a week, diluted cow's milk of less strength than before the attack, according to the directions given in the chapter on the Home Modification of Milk. In warm weather this milk should be sterilized. If the tongue remains coated, children over a year old may take two drops of dilute hydrochloric acid in essence of pepsin twice daily; and children of all ages must be kept in the open air as long as possible, or may be taken on a boat to derive the benefit afforded by the sea air.

DIFFICULT FEEDING CASES IN BOTTLE FED INFANTS
(PROLONGED INDIGESTION)

Here we have to deal with children who have not been properly fed for weeks and months, or perhaps not since birth. All kinds of food have been given in succession, with or without drugs in addition.

Symptoms.—Regurgitation, vomiting, colic; diarrhœa or constipation; incessant crying, no sleep, loss of weight; green stools with curds and some mucus. The children appear to be hungry. They become rhachitic or show evidence of scurvy, or they have slight general œdema, but are not yet in a condition of marasmus. The urine is free and there is no hypostatic congestion of the lungs.

Treatment.—Medication is hardly ever indicated in cases of this nature. If the infant is not over three to four months old, the question of a wet nurse must be decided at once. If artificial feeding is to be continued, it will be best in some cases to wash the stomach and bowels once or twice with boiled water. (See chapter on General Therapeutics.) After thus cleansing the gastroenteric tract, feed from the list given under the heading of substitute diet. Give no milk for the time being. Have the child taken out of doors from four to six hours or into the country or on water trips. Also give a warm bath or a cool sponge bath in warm weather.

Next in importance to the selection of proper food comes the hygienic management of the infant. A child should be constantly in the open air and out of the sun. It is also good practice to cleanse the mouth with a boric acid solution *before* nursing or feeding, particularly in the summer, for even germ-free breast milk or sterile cow's milk may become contaminated by the bacteria residing in the oral cavity and thus infect the entire gastroenteric tract.

Irrigation of the stomach and bowels may have to be repeated daily or every other day for a week or ten days. In extreme cases, when children get no rest day or night, we may allow them one dose of paregoric at night, ten to thirty drops, or a teaspoonful of the following mixture, also at night:

℞ Chloral hydrate, }
Potass. bromid., } āā,.......... .... gr. x;
Aq. cinnam.,.............................. ℥j.
Ft. solut.

It is not wise to resume milk feeding as soon as improvement is noticeable; it is better to wait a week or more. Then feel your way with low strength raw top milk (1 to 4) or sterilized top milk (1 to 4) in summer, or with white of egg and top milk, and discontinue irrigation as soon as possible.

TOP MILK AND WHITE OF EGG

℞ Water,	one pint and a half;
Top milk,	one half pint;
Sugar,	13 drachms;
White of egg,	one.

Sometimes *whey* with or without cream is tolerated best. Under certain circumstances diluted condensed milk (1 to 12) with evaporated cream added will be tolerated and digested, or some proprietary food may be tried.

In cold weather and in private practice, when it is possible to see a child at least every other day, it usually takes, on an average, two weeks of well directed effort to put the child on a proper feeding basis. No universal rule can be formulated which will insure success in the management of this class of cases. The physician must learn to individualize and feed in each particular case on its merits. If, after a reasonable trial with milk in various dilutions (during which time the children are to be out of doors all day, even in cold weather), *a milk idiosyncrasy is evident,* we must give up cow's milk feeding and nourish with food from the following: Meat broths and cereal decoctions with and without yolk of egg; gum arabic solution; white of egg in water; burnt flour gruel; cornstarch pap with egg.

CHRONIC INDIGESTION IN OLDER CHILDREN

The class of cases to be considered under this heading includes those of children who are off the bottle from two years up, also school children with chronic dyspepsia. They are pale, sallow, yellowish, and flabby, and have no ambition or appetite. Some are constipated, others have liquid, offensive stools, or gray, pasty stools. The tongue is coated, the breath is offensive, and they are subject to follicular stomatitis, have bad teeth, and are extremely nervous and irritable, particularly if they have a nervous mother. They grind their teeth in their sleep. *A neurotic suppression of urine* is occasionally observed and attacks of constipation lasting a week may set in with stupor, slow, irregular pulse, simulating *intestinal obstruction* or even *meningitis,* and many other phenomena due to intestinal toxæmia are observed. The temperature during such an attack is seldom above 102°, often normal or subnormal; the urine is brown from *indican.*

Associated with chronic indigestion we frequently find enuresis, reflex cough (adenoids), night and day terrors, vulvovaginal discharges, etc.

In all such cases a *careful clinical examination is called for in order to get at the underlying cause of the trouble* and be able to manage the case intelligently. This may involve a regional, blood, urine, and stool examination.

Ætiology.—The underlying cause may be syphilis, tuberculosis, malaria, malignant disease, rhachitis, scurvy, diabetes, renal disease, hepatic disease, cardiac disease, or pulmonary disease, central nervous disease, atony of the stomach, constipation, faulty diet (indulgence in candy, nuts, soft drinks), constant swallowing of pus from chronic nasopharyngeal catarrh, adenoids, etc.

Neurotic parents are often responsible for the indisposition of the children by reason of keeping them indoors or in overheated rooms for fear of their "catching cold." The extreme of mismanagement was observed by the writer in a neurotic family as follows: The mother, with the aid of an accommodating medical talent, had a padded box stall constructed, five feet square and four feet high, closed on four sides. This was placed in the middle of the nursery and the little "two year old" was kept in close confinement during the day in this box in custody of a trained nurse for seven months of the year, in order to prevent colds and cough, to which the child was subject. On careful examination this tendency to "catch cold" was found to be due to adenoid vegetations in the nasopharynx.

When the mother of a suffering child is not open to reason and the father is lucid, the physician should enlist the services of a nurse with diplomacy to manage the child properly, keeping the mother at bay. When both parents are dense, the case is almost hopeless, and the medical attendant will have to worry along or shift the responsibility to other shoulders.

Treatment.—The treatment of cases of chronic dyspepsia in older children involves, therefore, in addition to the dietetic management, a study of the underlying cause and *special treatment directed against the same.* Furthermore, we must seek to establish regular habits in the child and reduce the neurotic tendencies by a daily sponge bath.

The sleeping room should be cool and the living room not above 70° F. The child should be in the open air all day in fair weather and only come in for its meals. A change of climate is important in severe cases. The bowels should be made to move once a day, and massage of the abdomen or whole body should be performed daily. Older children should be sent to a gymnasium, and occasionally kept from school for a week or two when they appear fatigued or overworked. Gavage and stomach washing have their unpleasant features in older children with teeth, and will not as a rule be necessary. To aid digestion and overcome intestinal putrefaction, give

℞ Acid. hydrochloric, dil.,...................... ʒj;
Ess. pepsin.,.............................. ℥ij;
Tinct. quassiæ, ... ʒj.
M. S: A teaspoonful three times a day.

Ichthyol in emulsion, in one or two drop doses twice a day, has given good results in some cases. A plain diet adapted to the age and condition of the child should be ordered. Cabbage, beans, raw fruit, spoilt milk or cream, ice cream, sweets, soda water, etc., are forbidden. Maltine and cascara may be given to keep the bowels open, also enemata. The *underlying cause must be treated.* Give iron, phosphorus, arsenic for anæmia, quinine for chronic malarial disease (two to five grains every other day in a teaspoonful of compound elixir of taraxacum).

ACUTE FORMS OF DIARRHŒA

Dyspeptic Diarrhœa; Simple Diarrhœa

The term **summer diarrhœa** may be applied to this form, but should not be used in connection with gastroenteritis, which is always catarrhal or inflammatory. The danger of a simple diarrhœa in summer lies in the fact that it paves the way for severe inflammatory diarrhœas, and its timely treatment prevents dangerous disease. Simple diarrhœas are usually of nervous or dyspeptic origin.

PROPHYLAXIS.—*Diarrhœas can generally be prevented if the bottle food is sterilized before the warm weather sets in.*

TREATMENT.—First *remove the cause.* Undigested food must be removed by administering a laxative, such as castor oil (one to two teaspoonfuls). In addition, the colon may be flushed. Calomel may be administered in half grain doses every hour until six are taken. *The milk food, breast or bottle, must be stopped at once,* and slimy gruel of barley or oatmeal, gum arabic water, white of egg in water or toast water given instead. The infant should be kept quiet and have *good air.* In summer a change of air is often a necessity from seashore to mountains or from mountains to seashore. In and around New York City, use may advantageously be made of the Staten Island ferry and Coney Island and Long Branch boats for the sea air. Refreshing sponge baths should be given. Ten to twenty drops of whiskey may be given in water several times a day as a stimulant in selected cases.

Drugs to check the diarrhœa are usually not necessary. Should the stools remain liquid in spite of the above outlined management, the following may be administered:

℞ Bismuth. subcarb.,	ʒss.;
Aq. cinnam.,	℥ij;
Tinct. opii,	gtt. ij.

M. Sig.: A teaspoonful every three hours.

The medicine is to be stopped as soon as the diarrhœa is checked.

In returning to milk feeding, we proceed cautiously. The breast is offered at longer intervals, and the bottle milk should be given in greater dilution and less frequently than before the attack. In warm weather the bottle food should be sterilized.

SEVERE ACUTE FORMS OF DIARRHŒA

Acute Gastroenteritis (Cholera Infantum).—In order to make it clear to all concerned that there is a vast prognostic difference between a dyspeptic and an inflammatory diarrhœa in infants, the term "summer diarrhœa," which is used indiscriminately for diarrhœas occurring in warm weather, should be dropped or used only in connection with simple diarrhœa. The term "cholera infantum" is so universally employed in our country that it may be wise to retain it for all cases of acute gastroenteritis in infants, with the distinct understanding that we have to deal with two clinical varieties of this disease—the ordinary form and the choleraic form (grave form), which *differ only in severity,* as do the ordinary and severe forms of scarlatina and other infections. Cholera infantum is an acute gastroenteric inflammation *not* due to exposure to cold or to teething, but due to *bacterial infection* of the *gastroenteric tract* and *to the absorption of toxic products from fermentative and putrefactive changes in the stomach and intestines.* It is in fact a case of milk poisoning from bacteria. In large cities cholera infantum becomes epidemic in June, July, and August, and, according to the investigation of A. Seibert, of New York, temperatures above 60° F. are provocative of epidemic diarrhœas. This coincides with our knowledge of the turning point of milk, which is about 60° F. The summer heat, therefore, *not alone produces a constitutional depression, but is at the same time a causative factor of the fermentative change in infant's food, milk.* The bacteriology of the intestine in these cases has been carefully investigated by William Booker, of Baltimore, and others in our country, and by Baginsky and Escherich in Germany, but they are unable as yet to formulate a bacterial nomenclature of inflammatory diarrhœa.

SYMPTOMS AND PROGNOSIS.—Cases may develop gradually and in the wake of dyspeptic diarrhœa (subacute form), or *suddenly* after symptoms of indigestion of short duration. Fever, thirst, retching, and vomiting are the initial symptoms. Diarrhœa soon sets in. The stools may be of any color, with flatus of foul odor and accompanied by pain. The diarrhœa may be very profuse, and after a day or two the stools show mucus. There is great prostration with restlessness, and the heart's action is rapid. If the conditions are unfavorable and no improvement sets in, death may ensue in stupor or convulsions with cerebral œdema (hydrencephaloid). A fall of temperature and of the pulse rate, a lessened frequency of stools, and cessation of vomiting are favorable symptoms. Children over two years old usually recover; infants are in great danger from this disease. Much depends upon early judicious management. In other cases the stomach irritation ceases, but the stools remain diarrhœal with mucus and streaks of blood (ileocolitis).

PROPHYLAXIS.—Bottle fed infants should receive only *sterilized* food in hot weather. When a dyspeptic diarrhœa develops, the milk food should be stopped for a day or two and other food given. The child should be taken to the seashore or mountains or on day excursions. Children should receive sponge baths several times a day in the summer and cooled boiled water to drink. Overfeeding is bad. Weaning should not be attempted in hot weather. With such precautions cholera infantum is not apt to develop.

Soxhlet's method of home sterilization of milk was introduced to the American profession in 1887, and its general adoption and the distribution of sterilized milk to the poor of New York City during the summer has resulted in a marked decrease of inflammatory diarrhœas, which in antesterilizing days killed thousands of infants during the summer. It is now nothing unusual for colleagues practising among the middle and better classes to go through a summer without handling a single case of cholera infantum.

TREATMENT of Cholera Infantum (ordinary type). At an early stage give no food for six to twelve hours. Give ice, peppermint tea, or black tea, to which may be added five drops of whiskey if a stimulant is needed. On the following day select as nourishment one, two, or three articles from the following list: Barley gruel, oatmeal gruel, white of egg in water, gum arabic in water, cold tea, whiskey and water, lime water, bread water, mutton broth, cornstarch pap, burnt flour soup.

If the vomiting persists, the stomach may be washed once or twice on that day.

The indications are: 1. To quench thirst; 2. To rest the gastrointestinal tract; 3. Antifermentative medication; 4. Stimulation and prevention of collapse.

To meet indications 2 and 3 we employ the following drugs:

℞ Bismuth. subcarb.,	ʒj;
Aquæ cinnam.,	℥ij;
Tinct. opii,	gtt. ij.

M. Sig.: A teaspoonful every one to two hours.

Or,

℞ Acid. carbolic. pur.,	gtt. ij ad vj;
Mucilaginis,	℥ij.

M. Sig.: A teaspoonful every two hours.

Or,

℞ Argenti nitratis,	gr. ij;
Aquæ distil.,	℥ij.

M. Sig.: A teaspoonful every two hours.

Or,

℞ Resorcin,	gr. ij;
Aquæ cinnamomi,	℥ij;
Tinct. opii,	gtt. ij.

M. Sig.: A teaspoonful every two hours.

We avoid the addition of syrup to a mixture, if possible, and omit the opium if the patient apparently has little or no pain. When children are very restless, and show by their actions that they suffer pain, we do not hesitate to give small doses of opium, one, two, or three drops of the tincture in a two ounce mixture. In cases of circulatory failure with pulmonary œdema opium is contraindicated. A towel wrung out of cold water and secured over the abdomen appears to relieve pain, and a warm mustard bath stimulates in impending collapse.

For obstinate vomiting we frequently give:

℞ Tinct. iodin.,	gtt. xv;
Aquæ menthæ,	℥j;
Syrupi simpl.,	ʒij.

M. S.: Fifteen drops every hour.

In obstinate vomiting *stomach washing* is indicated. A *change of air* is of the utmost importance. Children taken from a hot tenement to the seashore or any cool, shady place improve perceptibly in a short time, if not too far collapsed. Large enemata of tepid water, with or without the addition of some antiseptic drug (acid. salicyl.), should be tried in obstinate cases, but in dispensary practice this method cannot well be carried out. *Stimulation* must not be delayed until symptoms of collapse are marked. Young children with a high temperature, cold and clammy feet and hands, and a pulse too rapid to be counted, are frequently stimulated in vain. The best stimulations are: Camphor, strychnine, caffeine, enteroclysis, and hypodermoclysis.

Their dosage and manner of employment are given in the chapter on General Therapeutics. Ice may be applied to the nape of the neck, and atropia sulphate may be given hypodermically in 1/500 to 1/300 grain doses.

During the period of convalescence, the mucilaginous and farinaceous preparations already mentioned must be given until all danger of relapse is over, and eventually milk feeding (sterilized and modified cow's milk) is resumed.

When there is a tendency to loose stools during the period of convalescence the following astringent drugs may be ordered.

℞ Acid, tannic., ... gr. ij;
Pulv. Doveri, ... gr. ¼;
Chocolat., ... gr. v.

Or,

℞ Plumb. acet., ... gr. ½;
Pulv. Doveri, ... gr. ¼;
Sacchari, ... gr. v.
M. S.: One powder four times a day.

℞ Bismuth. subnitrat., ... ʒij;
Aquæ, ... ʒxiv;
Ext. krameriæ, ... ʒj;
Syrup., ... ʒij.
M. S.: A teaspoonful four times a day.

Tannigen and *Tannalbin* may prove valuable instead of plain tannin. Lozenges of *tannate of quinine with chocolate* are readily eaten by children on account of their pleasant taste.

The severe form of acute gastroenteritis has a sudden onset with constant vomiting, high temperature, intense thirst, restlessness, cold surface, depressed fontanelles, glassy eyes, and early collapse. In consequence of the profuse drain from the stomach and bowels, the patient's body wastes rapidly, the eyes grow hollow, the nose becomes sharp, the cheeks fall in, and the features look pinched and drawn, while the flesh loses its elasticity, the abdomen is flaccid or shrunken, and the urine is scanty.

PROGNOSIS.—The *prognosis* in the severe form of cholera infantum is unfavorable. If infants survive the first two or three days, they may recover.

TREATMENT OF THE SEVERE FORM.—In the first stage food is a source of irritation and must be withheld for hours. It is well to wash the stomach and give cold water or cold peppermint tea to quench the thirst, also ice. The bowels should be irrigated with hot saline solutions to wash away putrid material and counteract collapse. The tincture of iodine prescription may be ordered. The surface circulation may be kept up by repeated hot packs or baths at 100° F. Black tea and whiskey may be given, and hypodermic stimulation employed.

℞ Ol. amygdal., ... ʒjv;
Camphor., ... gr. xv.
M. S.: Five to ten drops subcutaneously every three hours.

Or,

℞ Sp. frumenti, ... ʒij;
Fl. ext. digit., ... gtt. v.
M. S.: Five to ten drops subcutaneously every four hours.

When recovery takes place, farinaceous and mucilaginous drinks with yolk and white of egg in water may be fed for a week or until it is safe to return to diluted sterilized milk.

ENTEROCOLITIS, OR FOLLICULAR ENTERITIS

This is an infection of the bowel without marked gastric irritation.

Symptoms and Prognosis.—Diarrhœa, blood streaked, mucous stools. Fever with constitutional depression, as in cholera infantum, and a less severe prognosis.

The TREATMENT is dietetic, medicinal, and local (irrigation of bowel). During the acute stage the dietetic management is the same as in acute cholera infantum. Bowel irrigation should be employed at once if for no other purpose than to bring away putrid material. Irrigation of the bowel is possible up to the cæcum. Use a flexible tube. Elevate the hips. Irrigate from one to three times a day with warm boiled water or starch water.

Rectal suppositories to quiet pain:

℞ Ext. opii, }
Ext. belladonnæ, } āā, ... gr. $\frac{1}{8}$;
Butyr. cacao, ... gr. v.
M. S.: Use one to three a day.

Reduce high temperature by baths and sponging. Medicinal antipyretics are not to be resorted to in diarrhœal disorders. The graduated cool bath (reduced from 95° to 80°), continued until the rectal temperature has markedly fallen, is the proper means in all cases in which the high temperature calls for antiphlogistic measures. After the bath the warmth of the feet is maintained by hot water bags.

MEMBRANOUS ENTERITIS, OR DYSENTERY

A severe and often ulcerative inflammation of the lower bowel.

Symptoms and Prognosis.—Bloody diarrhœa, with mucus, tenesmus, fever. Often fatal in infants. Older children frequently recover.

Treatment is the same as for enterocolitis as regards diet and stimulation. In the way of medication, opium, bismuth, and astringent drugs are indicated when the dietetic management and bowel flushing alone are inadequate. In dysentery irrigation of the lower bowel with boiled medicated water is particularly useful. Use salicylic acid, 1 to 1,000, or argentic nitrate, ʒj to 1 pint.

The drugs to be given internally are the astringent drugs mentioned under cholera infantum. The antidysenteric serum treatment in cases of enterocolitis due to the Shiga bacillus has not been followed by noteworthy good results up to the present time. The dose of the serum is 10 cc. injected once or twice a day.

CHRONIC DIARRHŒA

Chronic diarrhœa in children is usually dyspeptic or fermentative; sometimes neurotic; symptomatic, as in hepatic, cardiac, renal, and other disease, or due to a previous catarrhal and ulcerative colitis.

The **Management** of the first two varieties has been sufficiently discussed under *Acute and Chronic Indigestion.* The *symptomatic diarrhœas* will receive brief mention under the various diseases in which they occur. Generally speaking, their prognosis depends upon the underlying cause. If a child has a chronic diarrhœa associated with diabetes or some other fatal disease, the prognosis is bad; and if it is associated with conditions which can be bettered or removed, the prognosis is good. The **Prognosis** depends upon so many factors that it cannot be formulated *en masse.* Chronic diarrhœa is a grave disturbance in weaklings, but an absolutely hopeless attitude is not justified except in intestinal tuberculosis and other fatal diseases.

The *Management* of a chronic symptomatic diarrhœa involves: Change of air, irrigation of the bowel, careful dieting, stimulation, and astringent medication.

SPECIMEN DIET.—Burnt flour gruel; slimy soup, with or without egg; cornstarch pap; scraped meat; mucilage of gum arabic; rice; farina; mashed potatoes; sterilized milk and lime water; buttermilk; albuminized food; tropon in mint tea; tropon with iron.

In such cases the peptonized foods have rarely been satisfactory. Good buttermilk, recommended by the Dutch physicians, has given marked satisfaction in a number of cases.

MEDICINAL TREATMENT.—*Bismuth* in large doses, 5 to 10 grains four times a day, with opium and with fluid extract of krameria.

Tannic acid, 2 to 5 grains several times a day.

Acetate of lead with Dover's powder, gr. ½ of each three times a day.

Tinct. ferri. chlor., 5 drops three times a day.

Lozenges of *tannate of quinine and chocolate.*

As an aid to digestion the author employs:

℞ Acid. hydrochloric, dil., }
Tinct. quassiæ,. } āā, ... ʒij.
M. S.: Five to ten drops in sugar water after eating.

Stimulation is occasionally necessary with port wine, sherry wine, or blackberry brandy.

Chronic Diarrhœa from Protracted Ileocolitis.—In protracted or chronic ileocolitis the catarrhal or rarely ulcerative changes in the intestine are frequently associated with bronchopneumonia or hypostatic congestion in the lungs, with large or fatty liver, and albuminuria (kidney congestion and nephritis). All this goes to show that a microbial diarrhœa was the starting point, and that the infection first located in the intestine has found its way into adjoining organs and tissues.

SYMPTOMS.—The symptoms are those of intestinal irritation and restlessness, flatulence, and occasionally colic with malnutrition and malassimilation. The children waste to a skeleton, are anæmic, have fissured mucous membranes (with sordes) which bleed readily. The skin hangs loose and the mouth may be the seat of thrush or stomatitis. There may be half a dozen stools a day, and sometimes vomiting is observed. The stools are thin, often green, contain mucus, and are offensive. Under the microscope the stools are found to contain pus, some blood, food remnants, and epithelial débris. The lymph nodes (inguinal and abdominal) are generally enlarged, the skin of the abdomen has lost all its fat and is thin, and the dilated and atonic intestine (colon) bulges out under the flabby parietes. Skin excoriations and ulcerations are present over various parts of the body, due to poor surface circulation, the pulse is weak, the extremities are cold, respiration is shallow, and the temperature is often subnormal. Dropsy of the feet is occasionally seen. The nervous system is blunted and convulsions are rare. Toward the end an ordinary or tuberculous bronchopneumonia usually sets in.

Chronic diarrhœa from intestinal ulcer may be due to simple ulceration in consequence of necrotic thrombosis of a small area of the intestinal mucosa or to syphilis or tuberculosis. Even malignant disease may be the underlying cause. A careful local examination with the finger and speculum may reveal an ulcerated condition. Also there should be an examination of the stools. When the small bowel is the seat of a lesion, the pain is of a colicky character and the fæces give a bile reaction. When the lower bowel is affected there are tenesmus, mucus, and pain.

TREATMENT.—Accessible ulceration will require local treatment in the way of rectal irrigation with nitrate of silver solution (ʒj to 1 pint). Ichthyol and tannin may be given internally, and suppositories per rectum to quiet pain (see Enterocolitis). The diet and medication are the same as for the other varieties.

In chronic diarrhœa from mesenteric, intestinal, and peritoneal tuberculosis or malignant disease of the bowel the treatment is symptomatic; medication will not cure. But almost every patient should have the benefit of the doubt and receive antisyphilitic treatment by inunctions of mercurial ointment, with potassium iodide, internally. In chronic diarrhœa from peritoneal tuberculosis laparotomy should be done, and it has saved lives. In older children suffering from ulcerative colitis a colonic fistula may be established and the bowel may be irrigated from above downward.

Chronic mucous colitis in which mucous discharges are the prominent feature should be treated as a neurotic diarrhœa, and rectal irrigations should *not* be continued for any length of time in such cases.

Amœbic Diarrhœa.—In this form living amœbæ are found in the warm liquid stools (see Laboratory Diagnosis.) Their significance is not understood. The treatment is as for other forms of diarrhœa plus rectal douching with quinine bisulphate, gr. xx to 1 pint of water, or with ichthyol in 2 per cent watery solution, or irrigation through a colonic fistula in intractable cases (see also amœbic Diarrhœa in adults).

MALNUTRITION AND INTESTINAL TOXÆMIA (MARASMUS, RHACHITIS, SCURVY)

Infantile atrophy (marasmus) is that form of malnutrition in infants and young children in which the child ceases to digest its food and gradually dwindles away and dies with all the symptoms of acute starvation. Starvation is a relative term in such cases, for it is not due to lack of food. The stomach may be regularly filled, but the power of extracting nourishment from the food is wanting. The infant grows thinner and more feeble daily, and, worn out by purging, pain, and want of sleep, dies. This ailment occurs most frequently during the first half year of life. **Atrophy of the thymus gland** is usually found in cases of marasmus.

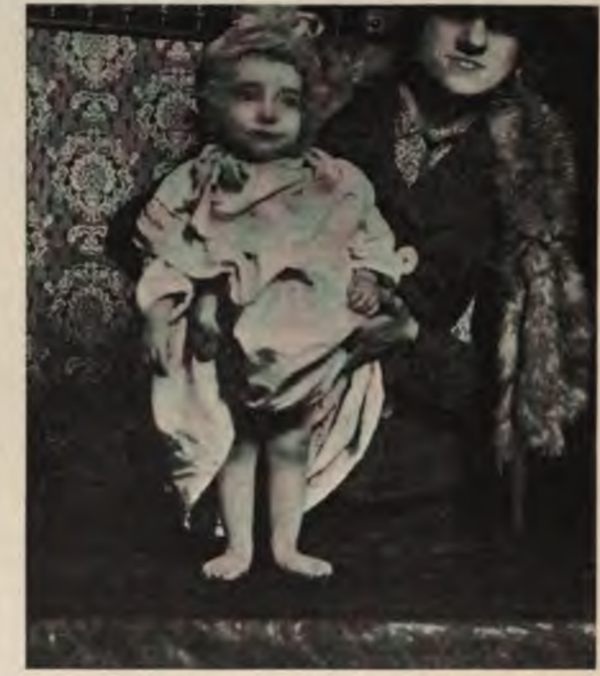


FIG. 52.—RACHITIC FLAT FOOT IN CHILD OF NINE MONTHS.

The starting point may be an acute indigestion or inflammatory diarrhœa from spoilt food milk. If at the time a proper food is selected, the trouble is promptly overcome. If not, malnutrition becomes chronic and finally the period arrives when no amount of manipulation will save the child. Infants at the breast may show malnutrition to a certain degree, but seldom get into the atrophic, marantic condition. The *symptoms* are those of progressive severe malnutrition (starvation), wasting, crying, little sleep, sunken fontanelles, stools scanty or diarrhœal, vomiting, anæmia, and flabbiness.

DIFFERENTIAL DIAGNOSIS.—Marasmus must not be confounded with ordinary starvation, and we must remember that mesenteric or intestinal tuberculosis or syphilis may be the underlying cause of a wasting process.

PROGNOSIS in a case of advanced atrophy in a young infant is bad, but no case should be given up as hopeless when the heart is sound and the lungs and kidneys are free.

TREATMENT.—Change of air from sea to mountain, or from mountain to sea, cleanliness of the mouth, and warm sponge baths. For young infants a wet nurse should be obtained. Top milk diluted, 1 to 3, sterilized or Pasteurized in summer, raw in cold weather, should be fed, the strength of the milk to be increased gradually. The stomach should be washed once a day if vomiting is a prominent symptom, particularly in older children. *Whey* and *cream* may be given, or asses' milk if it can be obtained. If a milk idiosyncrasy appears to be established, select from the list of substitute foods recommended for such conditions (see Difficult Feeding Cases). Subcutaneous injections of blood serum have been tried in infantile atrophy with *negative results*. Treatment with suprarenal and thyreoid extract has also been tried and found useless. Hypodermic injections of salt water (one ounce a day) have apparently benefited some patients.

RICKETS, RHACHITIS

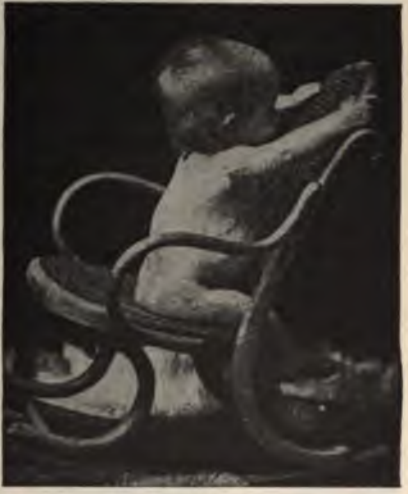


FIG. 53.—COMFORTABLE POSITION FOR CHILDREN WITH RHACHITIC WEAK BACK.

A peculiar manifestation of malnutrition or impaired nutrition. Rickets, like gout, has local and general manifestations most marked in the first two years of life. The bones and cartilages show characteristic changes. The epiphyses persist, and the medullary canal shows an excess of unfinished bone production (osteoid tissue). The stability of the skeleton is subnormal. These changes take place at the time of the best growth of bone (one to two years). Fœtal rhachitis is described. In rhachitis the general nutrition is below par, and changes occur in various organs. Marked fatty tissue may be observed. Some children become emaciated, particularly if suffering from severe diarrhœa. The muscles are flabby and soft (pseudo-paralysis). Bronchitis, pneumonia, enteritis, enlargement of the liver and spleen, spasmus glottidis, eclampsia, and tetany are noticed. The children have capricious appetites and walk late or lose the power of walking; the teeth come late; the cranial bones are soft (craniotabes). The fontanelles remain open. It has been shown that there is no lack of assimilation of lime salt in rhachitic children, and it is more likely that in rhachitis we have to deal with a diseased condition of the bone-forming cells.

Rhachitis is associated with a faulty diet and hygiene. It is a common disorder in bottle fed children and particularly such as fail to get *meat* *broth* and *farinaceous gruels with their milk after the seventh or eighth month.* Whereas chronic intestinal indigestion will often end in scurvy, rhachitis may develop in children who have shown little or no intestinal catarrh and intestinal toxæmia.

Clinical Forms of Rickets.—BONE RICKETS.—Craniotabes (soft cranium); rosary at the ribs; chicken breast; rhachitic spine; curvatures of the spine; bow legs; knock knees; square cranium (caput quadratum, with hydrocephalus combined); deformed clavicles; flat foot; pelvic deformity, etc.; enlargement of the epiphyses, etc.

MUSCLE RICKETS.—In rickets the muscles become flabby and powerless (*pseudoparalysis*). Children who have walked, fail to walk.

FAT RICKETS.—This term is used when children show only slight changes in the bone and are excessively fat. *Pot belly* is the term in vogue to designate the large abdomen of rhachitic children. Of nervous symptoms, we have laryngismus, tetany, convulsions, nystagmus, head nodding, tics, hydrocephalus, sweating of the head.

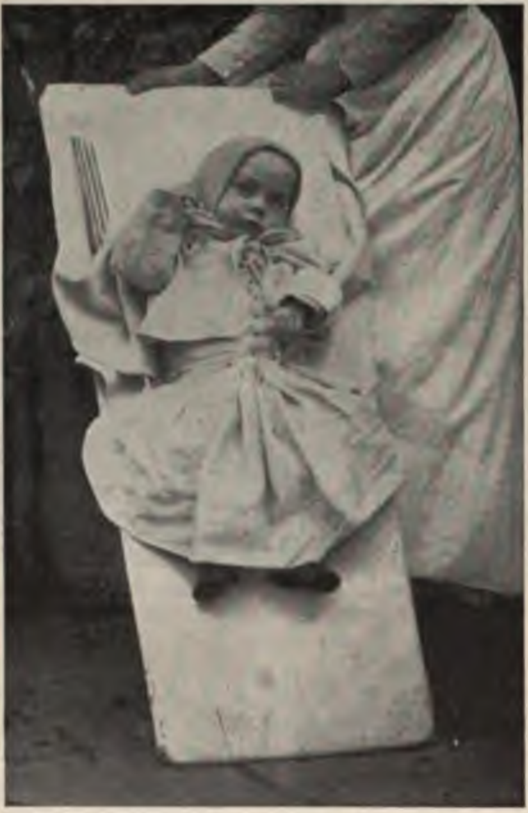


FIG. 54.—CARRYING-FRAME FOR FEEBLE RHACHITIC CHILDREN.

Generally speaking, rhachitis is accompanied by a tendency to catarrh of all mucous membranes and a feeble resistance to other intercurrent disease.

Rheumatic and scorbutic changes in and near the joints or epiphyses may be distinguished from rhachitic swellings by means of x rays. Rhachitic bone gives only a *faint shadow* in the x ray print. To discriminate between rickets and joint manifestations of congenital syphilis is difficult, in the absence of a syphilitic history. Infants are frequently rhachitic and syphilitic at one and the same time.

Prophylaxis and Treatment.—To prevent a child from becoming rickety, we must carefully attend to its diet, its digestion, and its hygiene. This involves all that has been said under Infant Feeding, breast, mixed, or bottle feeding. At the end of the seventh month meat broth and gruel with yolk of egg should be fed twice a day in addition to the five bottles of milk food. Children must live outdoors in good weather and sleep in cool rooms, and they must have a daily movement of the bowels. A similar management must be enforced to prevent children who are rickety from becoming more so. Children a year old and over may have rice, sago, farina, hominy with egg, beef broth, and toast crumbs, and may nibble a chop bone. The milk should be rich in fat.

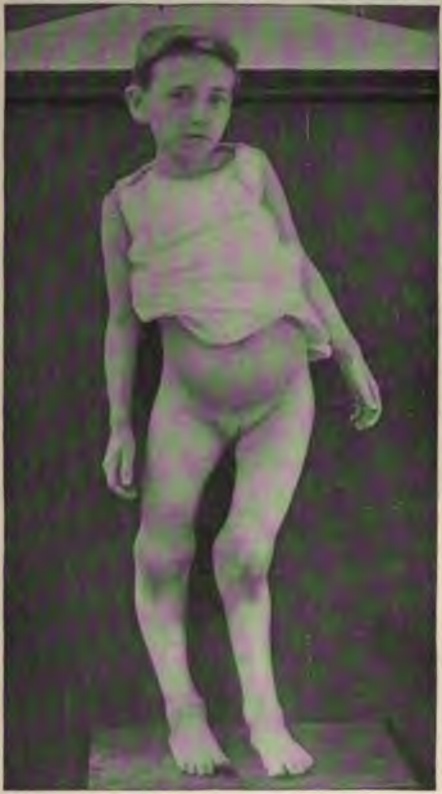


FIG. 55.—RHACHITIC DEFORMITY.

Of drugs, *iron, arsenic, phosphorus* are lauded and appear indicated.

Syr. ferri iodid., 10 drops three times a day.

Fowler's solution, 1 drop three times a day.

Elix. phosph. (U. S. Ph.), 5 to 15 drops three times a day.

Thompson's solution of phosphorus, 10 drops three times a day.

Such drugs are to be administered for two to four weeks and then discontinued for a week or two.

The thyreoid therapy, recommended for rhachitis, has been tried by the author in the Babies' Ward of the New York Post Graduate Hospital without showing noteworthy results. Malt preparations and fruit juice are serviceable for children one year old and over.

Bow legs and *knock knees* are rectified surgically by osteotomy. The results are good. A rhachitic thorax and spine may need gymnastics and orthopædic management (see Orthopædics). *Fractures* of long bones (green stick fractures) and epiphyseal detachments require splinting. *Laryngismus stridulus* is managed by means of cold sponge baths and bromide of sodium internally. In a few instances, and in urgent cases, the writer has tubed the larynx for hours and once for a week with very satisfactory results in cases of laryngismus.

SCURVY IN CHILDREN[1]

Scurvy is an acquired "hæmorrhagic diathesis" from intestinal putrefaction and toxæmia. This view is the more plausible if we remember that in hepatic, renal, and other disease we frequently notice in the later stages "hæmorrhagic" phenomena which we may attribute to the same causes,

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[1] See collective investigation on Scurvy in America, by the American Pædiatric Society.

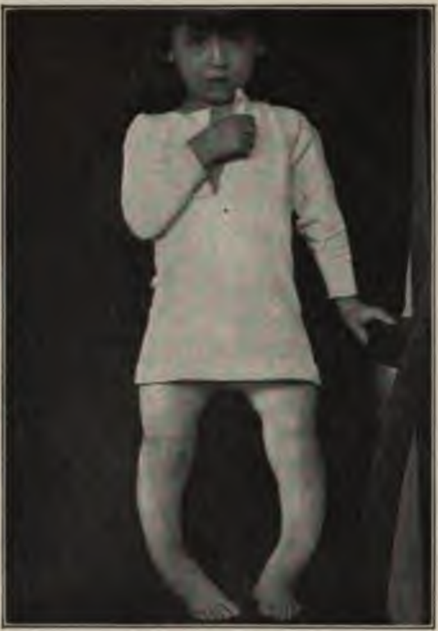

FIG. 56.—RHACHITIS.
Genu Varum before operation.

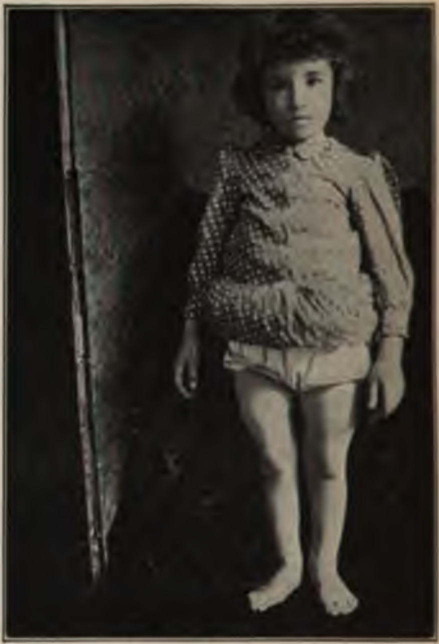

FIG. 57.—RHACHITIS.
Genu Varum after operation.

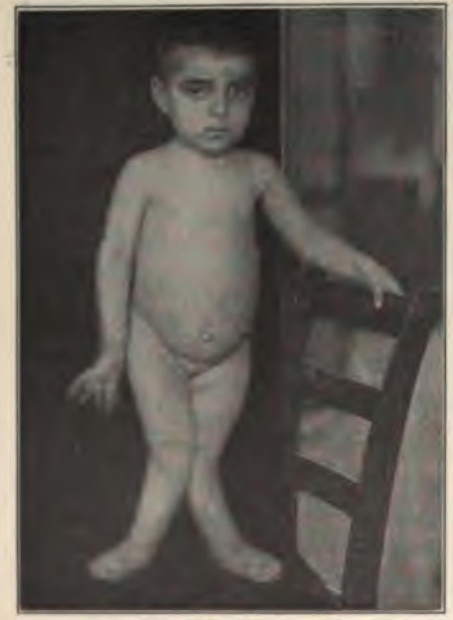

FIG. 58.—RHACHITIS.
Genu Valgum before operation.

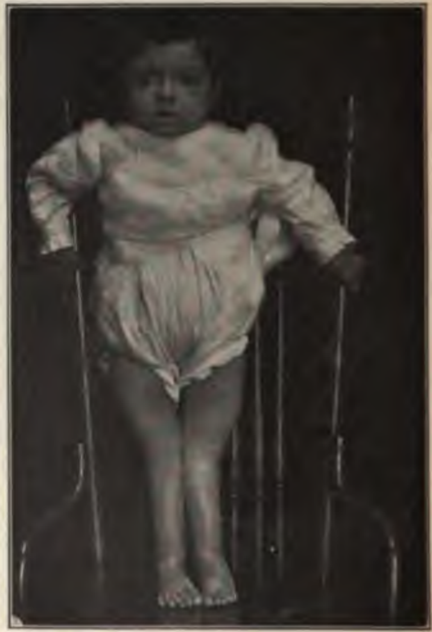

FIG. 59.—RHACHITIS.
Genu Valgum after operation.

viz., intestinal putrefaction and toxæmia. In adults the lack of fresh vegetables in the diet was formerly looked upon as the causative factor in scurvy. This view is erroneous. The Arctic explorer, Mr. Nansen, personally told the writer that during his three years' trip in the *Fram* not one case of scurvy developed among his party, and he attributes this remarkable immunity to the careful sterilization of all the perishable food taken along.

Pellagra, Maidismus, the so called *Alpine scurvy*, is due to the use of diseased maize as food. Scurvy in children follows the prolonged use of improper food.

Sterilizing, Pasteurizing, or cooking of milk is not per se responsible for the scurvy condition. Scurvy may develop in infants and children fed on breast milk, cow's milk (raw, sterilized, or Pasteurized), condensed milk, proprietary foods, etc. Out of 379 cases reported, only 12 had scurvy at the breast; all the others were bottle fed. Scurvy may be prevented, therefore, by selecting for each individual bottle fed child the food which it will digest and upon which it will thrive and gain.

Characteristic Symptoms in Scurvy are: Anæmia, pain on motion or handling, discoloration of the gums, subcutaneous and free hæmorrhages, swellings about the joints, spontaneous detachment of the epiphyses from the shafts of the bones, etc. Pain is clearly a very prominent symptom of the disease. Generally it is evident only when the child is moved or tries to move itself. Sometimes it is so intense that the approach of any one to the bedside is sufficient to cause the child to scream out through fear of being touched. The legs are usually flexed.

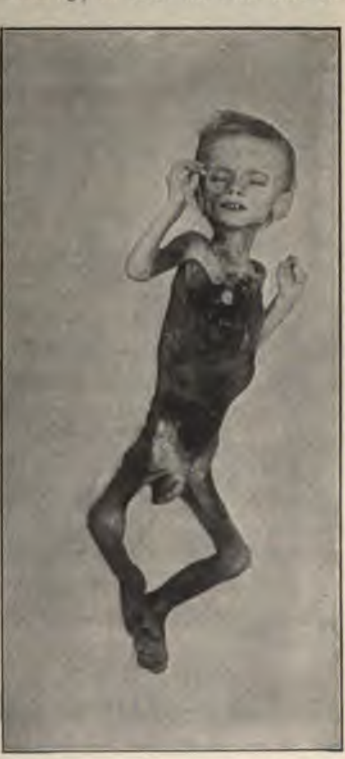

FIG. 60.—INFANTILE SCURVY AND MARASMUS (F. Huber).

Local swelling (hæmorrhages) may involve the soft tissues or may be subperiosteal. Protrusion of one or both eyes is probably due to orbital hæmorrhage. The gums are slightly swollen or discolored, spongy and ulcerated, and frequently bleed on being touched. A *purpuric eruption* and petechiæ are sometimes seen, and occasionally spontaneous hæmorrhages from the gums, nose, bowels, stomach, and genitourinary tract.

Fractures in infantile scurvy are usually separations of the epiphyses merely and are rare. *Fever* is often present but is not a prominent symptom. *Anæmia* and *malnutrition* are usually present and the percentage of hæmoglobin is much reduced.

Prognosis is favorable if the disease is recognized in good time.

Treatment.—Change of food, preferably to raw milk in cold weather; fruit juice or *hydrochloric acid;* cleanliness of the mouth; fresh air; treatment of any underlying cause; bowel washing.

Differential Diagnosis.—It is necessary to make a differential diagnosis between scurvy and the following diseases:

Rheumatic or Gonorrhœal Arthritis.—The joints, not the bone shafts, are involved; fever is high; characteristic scurvy symptoms are absent.

Rhachitis.—Rhachitic rosary; no marked pain; no ecchymosis or petechial or spongy gums; rhachitis and scurvy may coexist.

Purpura.—No history of improper feeding; rapid improvement of scurvy under treatment.

Infantile Paralysis.—Sudden onset with fever; difference of electrical reaction in the two diseases.

Syphilis may coexist with scurvy. The difference in the history must be taken into consideration.

Stomatitis.—This has none of the associated symptoms of scorbutic sore mouth.

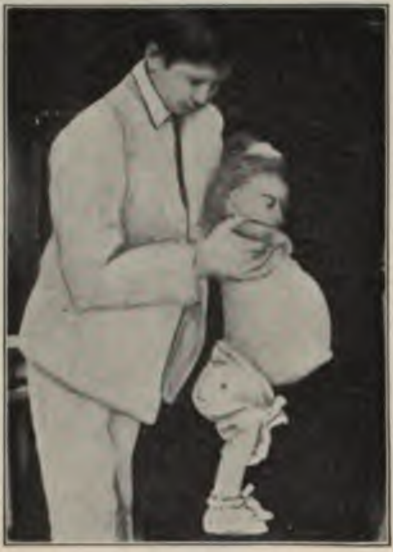

FIG. 61.—TUBERCULOUS PERITONITIS WITH ASCITES.

WORMS IN CHILDREN

The alimentary tract in children is apt to harbor three kinds of worms: ROUND WORM (ASCARIS LUMBRICOIDES); PIN OR SEAT WORMS (OXYURIS VERMICULARIS); TAPEWORM (TÆNIA).

The **round worm** is brown in color and is from four to eight inches long. It usually inhabits the small intestine.

SYMPTOMS AND DIAGNOSIS.—Colicky pain with occasionally a blood streaked stool may lead one to suspect worms. A positive diagnosis is based upon the passage of the parasite or the recognition of its ova in the stools.

TREATMENT.—A dose of maltine with cascara at night and one grain of santonin with sugar the following morning, to be repeated five or six times for five or six consecutive days.

The **pin worm** inhabits the large intestine and rectum, and has been found in the appendix (case of Dr. Inslee H. Berry, of New York city).

SYMPTOMS AND DIAGNOSIS.—Pin worms produce intense itching at the anus, and may be picked out of the anus in children.

TREATMENT.—A strong decoction of garlic in milk is injected with a piston syringe or fountain syringe once or twice a day after a cleansing enema of soap suds. Camphor ice or cold cream may be applied to the anus to overcome the itching and pruritus.

The Tapeworm.—A tapeworm gives symptoms, but the only certain indication of the existence of the worm is the passage of the links or a section of the worm.

TREATMENT.—One week before administering the tapeworm remedy, five drops of oil of turpentine and five drops of compound spirits of ether should be given on sugar three times a day. One day before administering the remedy, a saline aperient should be given. The following is then given in the morning at 8, 8.30, and 9 A.M.:

℞	Ext. filicis maris æth., fl.,	ʒij;
	Emuls. ol. ricini,	℥ij;
	Ext. rhei fluid., Ext. aloes fluid., } āā,	gtt. v;
	Syrup.,	ʒvj.

M. Sig.: Give in three doses.

After the worm is out it should be examined in order to determine whether the slender portion with the small head has passed. A second dose of the tapeworm remedy may be given in a day or two if the worm has not passed and the patient is not weak from the effects of the first dose. If children vomit the medicine, it may be given by stomach tube. *Salicylic acid* is also used as a tapeworm remedy. It is given in divided doses, forty grains in one day, followed by a dose of castor oil.

TUBERCULOUS PERITONITIS IN CHILDREN

The infection of the peritonæum may come about by way of the circulation or from the gastroenteric or genitourinary tract. It may readily take place in children without an antecedent history of tuberculosis.

The diagnosis of tuberculous peritonitis is based upon the abdominal symptoms, such as distention, pain, and disturbed bowel action, and the presence of fluid and loss of weight, and is made by exclusion, except in those cases in which the tubercle bacilli are found, and then the diagnosis is positive. A febrile rise of temperature of an irregular type has been found in all cases under careful observation. There is nothing characteristic about the temperature curve. *The fluid is an inflammatory exudate.*

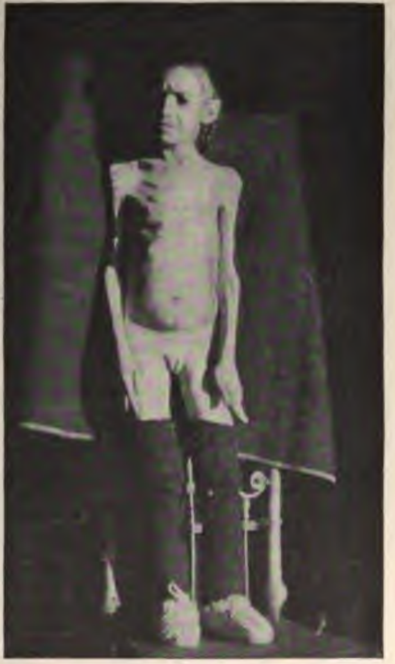

FIG. 62.—TUBERCULOUS PERITONITIS OF TWO YEARS STANDING.

Cases of chronic non-tuberculous serous peritonitis present usually the features of an ordinary ascites, the abdominal fluid being free, whereas it is usually not free in the tuberculous variety. It is rare to find the tubercle bacilli by microscopical examination of puncture fluid. In doubtful cases *the opening of the abdomen is indicated and will do no harm.* Paroxysmal pain in the abdomen of children, in the absence of chronic appendicitis or abdominal fluid, is not indicative of tuberculous disease and is frequently overcome by dieting and attention to and irrigation of the bowels. (See Worms, Intestinal Indigestion, Membranous Enteritis, etc.)

A routine test with tuberculin in human beings in the present unsatisfactory state of our knowledge of its action is hardly justified.

Clinical Varieties of Tuberculous Peritonitis.—1. *Chronic tuberculous ascites* (miliary form); 2. *Fibrocaseous tuberculous peritonitis;* 3. *Fibroadhesive tuberculous peritonitis;* 4. *Tuberculous peritoneal tumors;* 5. *Tuberculous ulcer* of the intestine and appendix with adjacent miliary tuberculosis of the peritonæum; occasionally *purulent peritonitis* from perforation of a *tuberculous ulcer.*

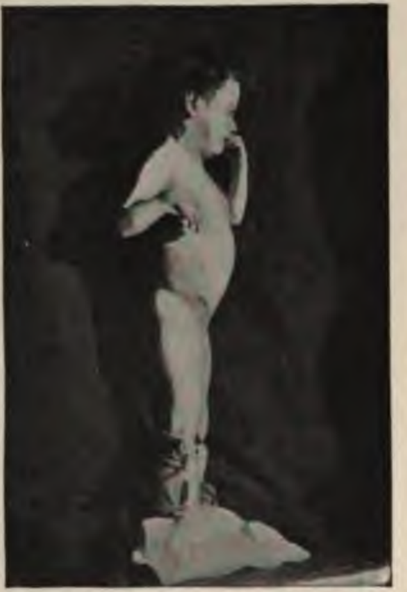

FIG. 63.—TUBERCULOUS PERITONITIS AND HERNIA.
Apparent Cure after Herniotomy.

TREATMENT.—In the present state of our knowledge, simple laparotomy is the best treatment for tuberculous peritonitis. The opening of the abdomen is, as a rule, followed by an arrest of local disease symptoms, and it may be followed by a disappearance of the tuberculous deposits on the peritonæum, as shown by certain cases in which the abdomen has been opened for some reason or other for the second time. The futility of medicinal treatment was experienced by the writer in a series of forty-one cases which were subsequently treated by operation. Where some form of medication is followed by improvement or cure, one must not forget that spontaneous cures have also been reported and observed in cases presenting all the clinical evidences of the disease. After opening the abdomen direct medication by iodoform emulsion or flushing with normal salt solution may be employed. Finally, the indication is an early operation, which is no doubt of very great benefit to the patient when the tuberculous process is limited to the peritonæum. As regards the establishment of a complete cure, one may be somewhat sceptical, because of the persistence of mild abdominal symptoms, of irritative catarrh or inflammation in the bronchi, lungs, pleuræ, and intestines, in cases which remain under observation after operation. If at the time of operation we have coexisting tuberculosis of the lung or pleura, the ultimate results are unsatisfactory, although some improvement usually takes place for the time being.

DISEASES OF THE RESPIRATORY TRACT IN CHILDREN

INTRODUCTORY REMARKS

This group of ailments centres around the symptom cough. Cough is a reflex phenomenon usually due to irritation in the respiratory tract. The tendency to "colds" and cough is most marked in anæmic, rhachitic, syphilitic children and in children who are housed and who sleep in overheated rooms, in children of tuberculous antecedents, and in children who have chronic malarial disease, or who are suffering from other chronic ailments. In addition to such general underlying conditions we have local irritation to take into consideration, such as is furnished by the presence of swollen follicles (follicular pharyngitis) or of adenoid vegetations or of enlarged tonsils and peribronchial tuberculous glands.

These statements apply to the entire group of respiratory ailments, and in the management of children subject to "colds" and cough all these points must be taken into consideration. It will not suffice simply to order an expectorant or cough mixture. Children should sleep in cool rooms and not be burdened by heavy woolen underwear, in which they are apt to perspire on the least exertion. It is important to keep the feet warm by wearing good stockings, but it is bad policy to keep the neck protected by furs and wraps, except in extreme weather. In neurotic children and adults we frequently observe a "nervous cough" which we are unable to locate. In the absence of local and constitutional causes, fresh air and a cool sponge bath daily are to be recommended for such conditions. Hot drinks are good expectorant mixtures, and a water trip, or absence from the dust laden city air is the best cough mixture, even in mild febrile cases of long standing. For harassing cough at night a few drops of paregoric with wine of ipecac may be appropriate.

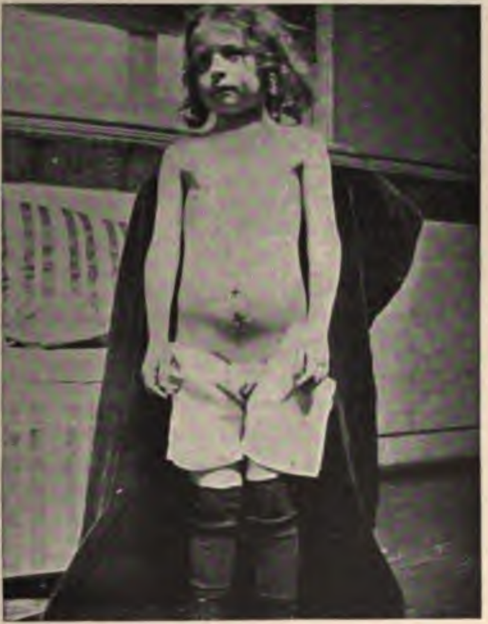

FIG. 64.—TUBERCULOUS PERITONITIS WITH CYSTIC ACCUMULATION OF FLUID. (Operation.)

No relapse or symptoms after four years.

Adenoids and large tonsils must be removed, and swollen follicles should be cauterized. In protracted cases one or two doses of quinine may be given as a therapeutic "feeler" for malaria, even in cases in which the blood is free of *Plasmodium malariæ*, and occasionally potassium iodide will promptly check a harassing or long standing cough.

CATCHING COLD

The rationale of the causation of the ordinary "cold" by reason of localized or general chilling of the body is made plausibly clear by recent studies on the bactericidal power of the blood of animals exposed to cold. It has been found that by chilling the surface it is possible to reduce the number of antibodies in the blood to a very marked degree. This means that the body is deprived of a goodly proportion of its defensive weapons, and therefore under such conditions it easily falls a prey to infections of all sorts. On the other hand, repeated exposure to slight degrees of cold brought about an increase of antibodies, and this observation therefore affords a theoretical justification of the practically approved methods of "hardening" the body by hydrotherapeutic and other methods of training.

Simple Acute Rhinitis, Pharyngitis, Laryngitis, Tracheitis, and Bronchitis are names given to the mild infectious catarrhs of the upper and lower respiratory tract, according to localization.

The SYMPTOMS are sneezing, lacrymation, coughing, moderate fever, loss of appetite, and a sensation of chilliness with mucopurulent secretion in the terminal stage. The mild forms last two to three days; the severe forms one to two weeks.

A persistent nasal catarrh with excoriation at the nostril is strongly suggestive of diphtheria, and a culture should be made and antitoxine administered if the Klebs-Loeffler bacillus is found.

Mild *overlooked nasal diphtheria with a free pharynx and subsequent measles and laryngitis and ultimate diphtheritic croup form a clinical sequence which has surprised many a colleague.* The possibility of syphilis should also be borne in mind.

In coryza there is a nasal discharge. In pharyngitis the pharynx is red and dry and there is hoarseness. In rhinitis, pharyngitis, and laryngitis we should examine carefully for diphtheritic patches in the nose and throat. Bronchitis and the measles eruption go hand and hand, as do pharyngitis and scarlet fever.

TREATMENT OF A "COLD."—In uncomplicated mild cases of catarrh in the upper respiratory tract the children are put to bed and a laxative is administered. Hot and cold drinks are given and a fluid diet or fever diet is appropriate. To wash away secretions and disinfect the nasopharynx, a few drops of salt water are poured into the nostrils by means of a spoon, every three to four hours, or an albolene spray may be used for the nose and throat. Older children may take three to five grains of saccharinate of quinine or euquinin. The management of laryngitis with a croupy cough and stridulous breathing is discussed under Croup.

The general hygienic management has been outlined in the introductory remarks. If children do not promptly recover, the urine should be examined and a general careful examination should be made, to detect if possible any further complications. It will not suffice to order cod liver oil and trust to luck, as in the good old days. Incipient tuberculosis can often be recognized by a careful examination, and frequently can be arrested and cured by energetic hygienic and dietetic management.

The Clinical Features of Acute Bronchitis in Children

Bronchitis is an inflammation of the mucous membrane of the bronchi. It may be unilateral, but is usually bilateral. It may be primary and represent an extension of a "cold" beginning in the upper air tract, and it may be secondary to or accompany many other forms of disease and is a common ailment in ill nourished and rhachitic children.

SYMPTOMS.—In the mild form of bronchitis we observe cough, accelerated breathing, a moderate rise of temperature, loss of appetite, vomiting, restlessness, and often a wheezing respiration. In the severe forms, which cannot be distinguished clinically from bronchopneumonia, the dyspnœa is more marked. The respiration may be 60 to 80, with slight cyanosis. The chest is filled with coarse moist râles. Attacks of respiratory failure are observed and occasionally we have the clinical evidence of acute emphysema.

The PROGNOSIS is favorable except in the severe form, which is often fatal to young infants, whereas older children usually get well.

DIFFERENTIAL POINTS.—Bronchitis may be the first symptom of measles and whooping cough and may indicate an irritation from inflamed and enlarged *peribronchial glands.*

TREATMENT.—A mild bronchitis is managed like any other form of "cold." In the winter the child is put to bed in a room heated to 70° F. and a change from one room to another is advisable. The patient should receive an enema and a warm bath and should have cool water to drink.

DIET.—Soft diet for older children. Infants take their usual liquid nourishment. As soon as the febrile stage is over children should be taken out of doors in fine weather. The nasopharynx should be kept moist by instilling ten drops of salt water into each nostril several times a day. In tardy convalescence, two or three grains of quinine in a teaspoonful of compound elixir of taraxacum may be given once or twice for the purpose of counteracting any underlying malarial factor. To check a harassing cough, five to ten drops of paregoric may be given once or twice, particularly at night. In the severe form of bronchitis the treatment is identical with that of bronchopneumonia.

Poultices, jackets, and inhalations are probably useless and are not employed by the writer. The protracted cough during the convalescence stage is favorably influenced by a change of air and mild cauterization of the nasopharynx with a five per cent solution of argentic nitrate. An albolene spray applied through the nostrils often relieves local irritation and cough.

Throat Coughs of Children.—*Hypertrophied tonsils* cause a constant cough, which becomes severely spasmodic at times.

Adenoids cause a frequent hacking sort of cough, as in beginning tuberculosis, due to the postnasal catarrh present in such cases.

Cough due to *Granular Pharyngitis* and its accompanying catarrh is characterized by its onset with emotional disturbance, as at the beginning of laughing or crying. Frequently the cough is of a dry and rasping character and the little patient is compelled to clear his throat frequently, with the expectoration of small pellets of gray sputum.

The treatment is directed to the cause.

BRONCHOPNEUMONIA IN CHILDREN (Catarrhal Pneumonia, Capillary Bronchitis)

Definition.—An infectious, diffuse pulmonary catarrh or inflammation without the typical "hepatization" which is characteristic of lobar pneumonia. The portal of entrance for the various microbes responsible for this condition is the respiratory tract.

The predisposing factors are, in the first place, the general ones applicable to all microbial infection or disease, viz.: lowered vitality from any and all causes (malnutrition, rhachitis, exhausting diarrhœas, malarial, and any, cachexia, and the breathing of impure dust and germ laden air). The breathing of pure *cold air* is not in itself a source of danger. Children who live and sleep in overheated and ill ventilated rooms are apt to suffer from all forms of infectious respiratory troubles. House infections in schools, school dormitories, and overheated and carpeted living apartments are daily occurrences among the rich and the poor alike. It is at all times difficult and frequently impossible to escape infection of some kind or other; but the time is ripe for abandoning the superstition and ignorance which invite infection by fostering and perpetuating the fear of breathing *cold air*. Rational precautions against catching cold need not be neglected.

Our knowledge of the bacteriology of bronchopneumonia is only fragmentary. The pneumococcus, staphylococcus, and streptococcus are principally in evidence, and the streptococcus infection appears to be the most septic and fatal. The secondary forms of bronchopneumonia complicating measles, whooping cough, scarlet fever, diphtheria, ileocolitis, influenza, and other diseases are all mixed infections.

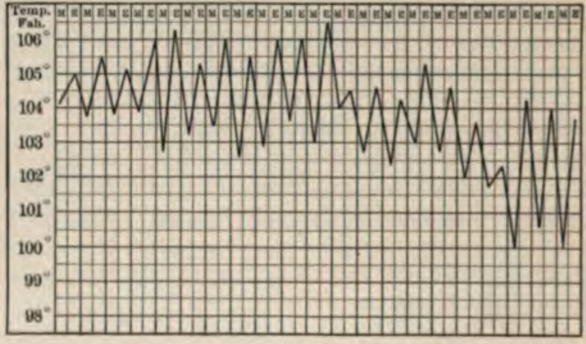

Fig. 65.—Temperature Curve in a Case of Septic Bronchopneumonia in a Child, Ending in Recovery.

Symptoms.—When the onset is sudden, or as a sudden exacerbation in bronchitis, we observe high fever, cough, rapid and embarrassed respiration, and sometimes cyanosis. The temperature curve is not characteristic as in the lobar variety of pneumonia. In some instances there is a low febrile temperature and the pulse is generally rapid and becomes weak with increased prostration. Convulsions are not frequent; late convulsions are ominous. Delirium and restlessness are observed. The digestion is poor, and tympanites with dyspeptic diarrhœa and vomiting complicates the situation. The urine is scanty and high colored and may show albumin, as in any other acute infectious disease.

Physical Signs.—Fine subcrepitant râles and sibilant, rough, coarse, and musical râles may be heard over one or both sides. Small scattered areas of dulness or atelectasis come and go, with bronchial breathing over the dull areas. To bring out the auscultatory signs the children must be made to cry. In some of the protracted and severe forms of bronchopneumonia the physical signs are almost nil, and in others the physical signs approach very nearly to those of the lobar type of pneumonia.

Clinical Varieties.—1, *Mild* or moderately severe primary bronchopneumonia, often beginning as a mild bronchitis, with convalescence in eight to ten days; 2, *Septic* form, lasting from three to eight weeks; 3, *Rapidly fatal* form of from one to three days' duration; 4, *Bronchopneumonia secondary* to other infections and of a varying degree of severity.

Termination and Sequelæ.—1, *Complete recovery;* 2, *Death;* 3, *Chronic bronchopneumonia* with and without emphysema; 4, *Empyema;* 5, *Tuberculosis* of the lungs; 6, *Complications* affecting the *pleura*, the *meninges*, the *pericardium*, the *gastroenteric tract*, the *ear*, and the *kidneys*.

Prognosis.—Bronchopneumonia is a serious disease in children, and particularly in acute septic cases and in exhaustion from previous illness. In bottle fed young infants in baby hospitals the mortality is above 50 per cent; in private practice, even among the poor, the mortality is far less.

Prophylaxis.—All cases of pneumonia should be isolated, and where a house infection is suspected it is best to remove the well children to another house for the time being. A child with bronchitis should have a few drops of salt water poured into the nostrils from a spoon three times a day and should live in good air. A trip on the water is a better tonic and expectorant than any form of medication. Difficult feeding cases in young infants should not be kept in children's hospitals for any length of time, on account of the patients' proneness to contract bronchopneumonia.

Treatment.—A child suffering from bronchopneumonia should receive a warm mustard bath of 100° F. and an enema or laxative and be put to bed in a well ventilated and sunny room.

DIET.—Infants should receive the breast or bottle and plenty of boiled water between times. Older children may take food as here outlined:

Beef broth and egg, eggnog, soup, cereal decoctions, toast in milk, lady fingers, custard, milk, ice cream, apple sauce, beef jelly, boiled water (cooled), ginger ale, cocoa, pineapple juice, orange juice, mint tea, green or black tea. Tropon, which is about 90 per cent protein, may be given in water, tea, or milk.

In acute febrile conditions, the food must be fluid or semifluid and in a form which will not overtax the feeble digestive apparatus or leave a large residue for decomposition and local irritation in the bowel.

HYDROTHERAPY.—*Fever* with great cerebral restlessness is best managed by some form of hydrotherapy. A temperature of 104° or even 105° is in itself no cause for anxiety, but, if coupled with restlessness and fleeting delirium, should receive special attention. An ice cap or cold coil to the head and flushing the bowels with cool water will reduce the temperature. A warm mustard bath at 100° F., reduced to 90° or 80° while the patient is in the bath, is a safe measure. A child may remain ten minutes in the water, and should be rubbed during the time, then wrapped in blankets, and put to bed and warm water bags applied to the stockinged feet. A cool sponge bath (water and alcohol) applied under a blanket is a safe procedure. Very restless children become more quiet if a cold compress is placed around the chest and renewed every two hours. Such a compress appears to act as a mild counterirritant, and when applied elicits a few deep inspirations, which are desirable. The writer has not observed any special benefit from the wearing of an oil silk jacket or a poultice. Such a contrivance is more soothing to an anxious mother than to a feverish child.

As the nasopharynx is apt to become dry in feverish children with rapid breathing, it should be moistened three or four times a day by pouring into each nostril ten to twenty drops of a one per cent salt solution by means of a spoon. An albolene spray is also useful for this purpose.

When the tongue is heavily coated, it is wise to aid digestion by administering hydrochloric acid. The following prescription is well suited for this purpose:

℞ Acid hydrochloric, dilut., ... ʒj;
Ess. pepsin., ... ℥ij.
M. S.: A teaspoonful four times a day.

For frequent vomiting the following prescription may be administered:

℞ Tinct. iodini, ... gtt. x;
Aq. menthæ, ... ʒvj;
Syrup. sacch., ... ʒij.
M. S.: A teaspoonful every two hours until vomiting is checked.

It is a good rule to give only one medicine at a time and if possible to get along without drugs.

Rectal Alimentation.—In all septic fevers in which digestion is below par we notice a loss of strength with emaciation, in which event rectal alimentation may be useful. From two to four ounces of an oil emulsion should be injected into the rectum three times a day.

Before giving a nutritive enema, the bowels should be flushed and cleansed. Rectal alimentation will probably not have much influence in counteracting the pernicious action of bacterial toxines on the nerve centres.

General Treatment.—*Stimulants and expectorants* are indicated when the pulse shows weakness, and when a loose rattling cough is accompanied by prostration or the "typhoid" state. Camphor, ammonia, ether, strychnine, and nitroglycerine may be given. In bronchopneumonia secondary to some other disease stimulation may be necessary from the beginning. (For stimulation, see chapter on General Therapeutics in Disease.)

Urgent dyspnœa is best combated by means of heart stimulants and expectorants and mild general massage. Artificial respiration is not to be overlooked in the management of such a condition. When the patient is cyanotic and the surface veins are filled, venesection may be helpful in older children. (See Venesection.)

Oxygen inhalations are much in vogue. Their precise value in our remedial paraphernalia is unknown, but they appear to do no harm.

When the acute stage of bronchopneumonia is passed and the disease continues in a mild way, it is well to remember that syphilis and chronic malarial disease are frequent substrata of acute infectious disorders.

Therefore it is rational even in the absence of the plasmodium in the blood, to give a few doses of quinine or iodide of potassium as a "feeler."

℞ Quinin. sulph.,	gr. x;
Elix. tarax. comp.,	℥j.

M. Sig.: A teaspoonful twice a day.

℞ Potass. iodid.,	ʒss.;
Spt. ammon. anisat.,	ʒss.;
Syrup. simplicis,	ʒij;
Aquæ,	ad, ℥ij.

M. Sig.: A teaspoonful four times a day.

Potassium iodide is, moreover, an expectorant, and may be given per rectum, and quinine carbamide may be given in solution *subcutaneously* if necessary. When convalescence is tardy, the patient should be drugged as little as possible and should receive the stimulating and invigorating effects of fresh air. One should not hesitate to send feeble children with a slight rise of temperature to the seashore and have them take short trips on the water, stopping all medication. In *tuberculous bronchopneumonia* intermittent high fever continues and the children waste away. In the absence of a sputum examination this condition must be inferred from its clinical manifestations.

Chronic bronchopneumonia with and without acute attacks of "asthma" and progressive emphysema is frequently met with in children's practice.

In such cases much can be accomplished by careful management of the nasopharyngeal and digestive tracts. Such cases require pure air and cool sponging. The patients must have regular bowel action and must not be tortured by being compelled to wear thick flannels; protection from cold temperatures is best gained by means of heavy outer garments. Medication is useless, but the potassium iodide expectorant mixture is indicated in intercurrent attacks of mucopurulent bronchitis.

ACUTE LOBAR PNEUMONIA IN CHILDREN (FIBRINOUS, OR CROUPOUS, PNEUMONIA)

This is an acute infection of the lung by the pneumococcus. The portal of entrance is naturally the respiratory tract. There are three stages in the course of this form of pneumonia: 1. Congestion; 2. Hepatization; and 3. Resolution. Recovery from the disease is usually ushered in by a critical sudden defervescence.

The mortality from lobar pneumonia in children is greatest in the first year of life, and it is not high in children above two years of age, a vast number of cases terminating in complete recovery. Mortality statistics in lobar pneumonia are not trustworthy, on account of the difficulty of distinguishing between lobar pneumonia and bronchopneumonia.

Symptoms.—The onset is sudden or occurs during a mild attack of bronchitis with vomiting and chill.

Pain, which is not always present, is often referred to the abdomen. Pain in the right side of the abdomen, with tympanites, simulates appendicitis. The temperature is from 103° to 105° in the general run of cases. The pulse is full, strong, and from 120 to 130. The respiration is from 30 to 50. The cough is short and occasionally painful; there is no expectoration. The face is flushed and there is restlessness, with a coated tongue, loss of appetite, and thirst, also mild or active delirium, and convulsions (occasionally). Leucocytosis is generally to be observed. About the seventh day the temperature drops to normal or subnormal and marked improvement is manifest. Convulsions indicate a violent onset, but not necessarily a grave prognosis. Convulsions at the time of resolution are ominous and indicate meningeal complications or circulatory failure with inanition of the brain.

Clinical Varieties in Children.—The usual localization is in the *inferior or middle lobe*, to which the inflammation is limited or from where it may spread.

Apex pneumonia is also common and may be accompanied by severe delirium, sometimes convulsions. The cough is short and gagging.

Central Pneumonia.—The localization is deep seated, and it may take from four to five days before the localization is clearly demonstrable.

Double Pneumonia.—This is a grave condition with urgent dyspnœa, but not so fatal as in adults, particularly if one side clears up before the other. In one-sided pneumonia the unaffected lung of the other side may be congested, which condition gives the mistaken idea of a true double pneumonia.

Abortive pneumonia differs in the ordinary form only in duration and rapidity of defervescence, which may take place at the end of two or three days. This form gives rise to the mistaken idea that pneumonia can be aborted by drugs now in use.

Wandering pneumonia is characterized by steady advance of consolidation from lobe to lobe.

Massive Pneumonia.—The physical signs simulate effusion because the air cells and bronchi are filled with exudate.

Physical signs, in acute lobar pneumonia in children.—

1ST STAGE: *Congestion.*—Weak respiration sounds, crepitant râles on deep inspiration or expiration.

2D STAGE: *Consolidation.*—Dulness on percussion, increased vocal fremitus, bronchial breathing. The latter may be temporarily absent when a large bronchus is filled. In children *dulness, fremitus, and bronchial breathing may be observed in pleuropneumonia with effusion.*

3D STAGE: *Resolution.*—The physical signs are practically the same as in the first stage. The râles are moist.

Disease Conditions Simulating Lobar Pneumonia.—*Hypostatic congestion* and *pulmonary œdema* give dulness at the base, weak breathing sounds, râles, and dyspnœa. The history of the case and the absence of bronchial respiration and of the typical high temperature will usually clear up a doubtful case.

In *bronchopneumonia* the physical signs are those of a diffuse bronchitis with scattered small areas of dulness. It is sometimes impossible to distinguish one form from the other.

Acute tuberculous pneumonia is not an unusual manifestation in young children of tuberculous parentage. The history, the high temperature curve, often remittent, the dyspnœa with cyanosis, and the loss of flesh will lead to the recognition of this ailment. Its occasional massive lung dulness will give the impression of *fluid* in the chest, but it is found to be absent on puncture. In infants a diagnosis between lobar pneumonia and bronchopneumonia is often impossible. The post mortem room shows frequent errors in this respect.

Pleurisy with effusion in young children should not be mistaken for pneumonia, on account of the marked difference in the physical signs. In obscure cases a puncture will determine the presence or absence of fluid.

Treatment.—We have at the present time no specific drug which will abort or cure lobar pneumonia. The disease is self-limited, usually ending in recovery, and medication plays a minor rôle in its management. A child taken ill with pneumonic inflammation should receive a warm bath, at 100° F., an enema, or two to five grains of calomel, and should be put to bed in a well ventilated room, at about 68° F. A young child should receive the breast or bottle and plenty of cool boiled water to quench thirst. Older children are put on liquid diet: Beef broth and egg, soup, gruel, toast in milk, lady fingers, custard, stewed apples, milk, water, ice cream, ginger ale, pineapple or orange juice, tea or mint tea, tropon, cocoa, junket, calves' foot jelly.

The appetite in acute febrile disease is always below par, and a change to peptonized food is in the vast majority of cases *not called for*. A few drops of dilute hydrochloric acid in sugar water three times a day will aid digestion, and this is a rational routine prescription in febrile and other disease for patients above one year of age.

When the time for a critical drop of temperature has arrived and the fever continues, we must look for complications or we may recognize an extension of the pneumonic inflammation to adjacent territory or we conclude that we have been mistaken as to the kind of pneumonia present. When dulness persists for several days, after the critical drop of temperature, it means delayed resolution or a pleuritic exudate. In delayed resolution the child should be carried into the open air daily or taken to the seashore or country; iodide of potassium may be given per rectum (five grains twice daily) in an ounce of warm water or by mouth.

℞ Potassii iodid.,	ʒss.;
Spt. ammon. aromat.,	ʒss.;
Syrup. simplicis,	ʒij;
Aquæ,	ad, ℥ij.

M. Sig.: A teaspoonful every three hours in water.

Children with tuberculous antecedents may take maltine and creosote.

High temperature with cerebral restlessness is managed by hydrotherapy and the ice cap, not as a rule by drugs. While the patient is in the bath the temperature of the water may be reduced from 100° to 80° F. Sponge baths are serviceable in mild cases of pneumonia.

Circulatory Failure and Stimulation

In *lobar pneumonia* circulatory failure is due to sepsis and pulmonary obstruction combined. In general practice a moderate rise of pulse and temperature appears to be the indication for the administration of the various heart drugs in use at the present time. It is questionable whether early and promiscuous stimulation is in the interest of the patient. Unfortunately, the indications for stimulation are by no means clearly understood, and no doubt in many instances we credit happy results to some particular drug or method, when the inherent reserve power of the heart alone is responsible for the recovery of the patient. Taking this view, it would appear a more rational plan to adopt enteroclysis for early stimulation, instead of drugs.

Enteroclysis stimulates through the abdominal sympathetic and promotes kidney secretion and thereby elimination of septic products. Moreover, it promotes intestinal absorption of water *whenever the body craves it.* Intestinal irrigation is performed with the aid of Kemp's double current flexible tube or a plain soft rubber catheter. The fluid used is a solution of salt (ʒj to 1 pint) at 110° F., and the flow is kept for ten minutes. Medicinal stimulation with alcohol, camphor, caffeine, strychnine, digitalis, or nitroglycerine may be employed in urgent cases in connection with enteroclysis, but in the majority of instances children get well without drugging

PLEUROPNEUMONIA—PLEURISY WITH SEROUS EFFUSION AND PYOTHORAX IN CHILDREN

GENERAL REMARKS

Physical diagnosis as applied to the thorax gives such positive evidence of abnormal conditions that it would seem impossible to overlook a general or localized pleuritic exudate or be in doubt as to its presence or absence in a given case. It is, however, a daily occurrence for mistakes to be made in this direction, for faulty conclusions to be arrived at from a faulty interpretation of symptoms and physical signs, and for the presence of pus within the thorax not to be recognized.

The infection of the pleura is occasionally primary, but takes place principally through direct extension from the bronchi or lungs and from purulent affections of other organs, and through a metastatic process. External injury followed by infection also takes place; exposure to cold should be looked upon merely as a predisposing agent.

Pleuropneumonia with effusion is found in children of all ages. The diagnosis is made by the physical signs to be discussed under Empyema and by exploratory puncture. The symptoms are those of severe pneumonia, the dyspnœa being particularly distressing. The prognosis is grave. Very young children rarely recover. In older children the outlook is not so unfavorable.

Pleurisy with Serous Effusion.—Primary pleurisy is infrequent in children. Its onset is insidious, with fever of an irregular type and with pain. Shortness of breath is observed as soon as the effusion sets in. The signs of fluid in the chest are discussed under Empyema. Friction sounds may be heard above the level of the fluid. The character of the fluid is elicited by puncture.

PROGNOSIS.—Most cases end in recovery.

Pyothorax.—The vast majority of empyemata are secondary to pneumonia, pulmonary gangrene, pulmonary tuberculosis, pertussis and eruptive fevers with catarrhal or fibrinous pneumonia, pericarditis or peritonitis, or are sequelæ of rheumatic infection, infectious nephritis and perinephritis abscess, osteomyelitis, diphtheria and "croup," typhoid fever, gout, pyæmia, ulceration of the trachea, œsophagus, and stomach, appendicitis, or abscess of the liver or spleen.

Pyothorax developing during typhoid fever is not at all rare; pyothorax developing after pneumonia following intubation for diphtheritic stenosis is exceedingly rare. As to the time of year that most cases of empyema in children are observed, it is evident that cold and damp weather, which is the predisposing factor in bronchial and pulmonary catarrh and inflammation, is also the predisposing factor in empyema. Thus, we see more cases in February, March, and April than in the nine other months of the year. The pulmonary type of influenza is responsible for quite a number of cases of empyema. Empyema is a common disease in children under five years, and it may be stated in a general way that one third of all pleuritic effusions in children are of the nature of pus or seropus.

In gangrene of the lung and in pyopneumothorax due to traumatism a stinking, septic pus is found. Pus is frequently found streaked with blood. A sanguineous pleuritic exudate, such as is found in tuberculosis and occasionally observed as a complication in articular rheumatism, is very apt to become pus. Occasionally inspissated pus is found. A colloid substance representing inspissated serous exudate is very rare. Chylous effusion has been observed and mistaken for pus. The upper layers may consist of seropus, the lower layers of thick creamy pus; loose and adherent pseudomembrane is often found. Occasionally the quantity of pus observed does not exceed an ounce, and frequently it reaches one, two, or three pints.

We have unilateral, bilateral, free, and multilocular encapsulated pyothorax, in which latter case one pus sac may be drained without emptying the other. The *bilateral* form may be primary or follow pulmonary gangrene, typhoid fever, tuberculosis, etc. The thoracic abscess may be interlobar, anterior, posterior, lateral, or located on the diaphragm.

After these general preliminary remarks on the subject of pyothorax we will confine our attention to the diagnostic points, our consideration of which will embrace the *physical diagnosis of fluid in the chest.* A purulent fluid is distinguished from a serous fluid by the aspirating needle alone and not by any set of signs or symptoms. The presence of peptone in the urine in cases of pyothorax is by no means a distinguishing feature. Von Jaksch has found peptonuria in scurvy, in intestinal ulceration, in the third stage of pneumonia, and in syphilis. Furthermore, in making our diagnostic enquiries, we must always bear in mind the occurrence of hydrothorax, free or localized and sacculated, in consequence of disease of the heart, lungs, or kidneys.

Subacute cases of pleurisy with irregular temperature curve, pain, cough, and dyspnœa due to effusion will be readily recognized by a careful observer. The change of a simple pneumonia into a pleuropneumonia is also not very difficult to recognize. Children with simple pneumonia cry readily and apparently without much effort or pain. A child with pleuropneumonia will give evidence of pain when it is handled and in crying. In pleuropneumonia the respiration is rapid and superficial and occasionally intercepted. Diaphragmatic respiration stops and the entire thorax is lifted in the efforts of respiration.

The puzzling cases are the very acute ones in which, in the absence of expectoration, the initial symptoms of pneumonia and pleurisy in children are about the same, i. e., fever, pain, cough, rapid breathing, and dyspnœa, and where (1) critical defervescence takes place with dulness on percussion continuing, or (2) a continued irregular temperature curve extends over the second and third weeks of illness with marked dulness persisting. (See Unresolved Pneumonia or Effusion.) In such cases the question arises: Have we a pulmonary dulness to deal with or an effusion or both? And what is the nature of the effusion? Our decision is based on inspection, palpation, auscultation, percussion, and puncture.

EXAMINATION.—*Inspection.*—Rational signs of fluid: 1, Lateral curvature of the spine; 2, Lack of movement of the affected side; 3, Bulging of the affected side; 4, Bulging or retraction of the intercostal spaces on inspiration; 5, Displaced heart; 6, Dyspnœa; 7, Cutaneous œdema; 8, Enlargement of the subcutaneous veins; 9, Pallor of the skin.

All these signs may be present or most of them absent in empyema; moderate dyspnœa on exertion is usually noticeable in pleuritic effusion, also bulging of the affected side when massive effusion is present. *On deep inspiration the intercostal spaces become convex*, but occasionally we notice a retraction or concavity of the intercostal spaces on inspiration in the presence of fluid. Pallor and loss of appetite are generally noticeable in cases of pyothorax. A displaced heart is not commonly seen, but must necessarily be noticed in massive effusion on the left side. Cutaneous œdema and enlarged veins are occasionally present. Lateral curvature of the spine is seen in cases of long standing, and where a chronic sinus has existed we find marked curvature, a deformed chest, a shrunken side, and a depressed shoulder.

Fever.—Fever in pyothorax is irregular and sometimes absent, as in cold abscesses in other parts of the body.

Palpation.—Rational signs of fluid: 1, Bulging of the lower intercostal spaces on inspiration; 2, Absence of vocal fremitus.

If the finger tips are pressed upon an intercostal space, an outward bulging will be felt on inspiration in the presence of fluid. This sign, however, is not always present in hydrothorax or pyothorax, and is generally absent in the presence of small exudates or in cases of rhachitic thorax with a very narrow intercostal space.

Vocal fremitus is usually absent over a fluid, and educated finger tips will map out a small localized sacculated exudate with nicety. Bacelli's sign, a diminished fremitus in the presence of thick exudates, *cannot be relied upon to distinguish serum from pus.* In some instances fremitus over a fluid is present, but diminished as compared with the sound side or as compared with the fremitus over the region of the compressed apex of the lung of the affected side. This is readily understood if we remember that vibrations may be communicated to the chest wall by means of localized pleural adhesions. In order to enable the examiner to note the presence or absence of fremitus, the children must be made to cry. The cry is usually weak.

Auscultation.—Rational signs: 1, Absence of respiratory murmur; 2, Weak voice, cry, or cough; 3, Noisy respiration.

The absence of the respiratory murmur is a classical sign of the presence of fluid in the thorax, but there are exceptions to this rule, as in the *case of a consolidated lung with compression or occlusion of the bronchus.*

A thin layer of fluid surrounding the lower part of a lung will not obscure the breathing sounds. When a thoracic abscess has been partly expectorated through a perforation into a bronchus, moist râles may be heard over the affected side, which is still dull on percussion. Tubular breathing may be heard over fluid, transmitted from a pulmonary dulness on the affected or the opposite side and due to compression or inflammation of the adjacent or underlying lung. Catarrhal pneumonia with pyothorax will give all the usual varieties of râles, and the same is true of hypostatic pneumonia or pulmonary œdema and pyothorax.

Friction sounds are heard before and after exudation, but not over fluid. Diminished vesicular breathing, perceptible fremitus, and dulness speak for thickened pleura or membrane or new growth. In empyema the trachea may be so obstructed that inspiration and expiration are impeded and a noisy and croupy respiration is present. Ægophony is occasionally heard in the axillary line in the presence of large exudates. Pseudocavernous signs in the shape of amphoric tubular breathing are sometimes met with in children, suggesting the presence of tuberculous or non-tuberculous cavities in the lung. This phenomenon is particularly misleading when associated with the noise of the cracked pot on percussion. Bronchophony is heard over consolidated lung tissue, not over fluid. The voice and cry in empyema are weak; the cough is weak, short, and generally moist.

Percussion elicits flatness and marked resistance to the finger in conditions of fluid in the thorax. On the right side this merges into the area of liver dulness. A rhachitic flat chest or deformed thorax gives apparent dulness on percussion and occasionally misleads the examiner. Dulness of the posterior right thorax in infants is not always pathological, and is frequently due to compression by a large liver during forced crying. This dulness disappears during inspiration. A pathological dulness remains during inspiration and expiration. A consolidated lung, thickened pleura, thoracic new growth, hypostatic pneumonia, or pulmonary œdema shows dulness on percussion. A massive pneumonia with the bronchi plugged with fibrin may present an almost flat percussion sound and undue resistance to the finger; in such cases the increased fremitus will establish with great probability, but not with certainty, the absence of fluid.

In the presence of a thin layer of fluid forced percussion brings out the percussion sound of the underlying lung. In copious exudates the flatness may reach the clavicle and extend beyond the sternal margin of the affected side. When the lung is pressed into the apex by a fluid, the lower area is flat on percussion with absence of breathing sounds and absence of fremitus, and in the apex over the compressed lung we find high pitch dulness, tubular breathing, and increased fremitus, also, occasionally, in a pliable thorax, we obtain the sound of the cracked pot on percussion just below the clavicle (pseudocavernous sign). In apex dulness, with absence of breathing sounds and absence of fremitus, a localized anterior abscess may be suspected.

A *marked resistance to the finger on percussion is of very great value as a diagnostic sign*, and will often establish the presence of fluid. The degree of dulness and resistance on percussion depends principally upon the thickness of the layer of fluid.

A marked displacement of neighboring organs is rarely found on percussion in children. In one case of pyothorax on the right side I found the heart beat in the left axillary line. The alteration in the height of fluid on change of position and the curved line of Ellis and Garland are indistinct manifestations in children. To appreciate the finer phenomena as elicited by percussion, it should be practised with the fingers only.

Now, bearing in mind the variability of the physical signs and rational symptoms of fluid within the thorax, it is evident that occasionally in a given case the ætiology is important in order to appreciate the physical conditions present. When an unresolved pneumonia is suspected and an empyema overlooked, we generally have a history of pneumonia with critical defervescence and a subsequent rise of temperature, with continued dulness on percussion.

When we suspect fluid, we can prove its presence or absence best by means of the aspirating needle, and as regards the character of the fluid, this is established by the aspirating needle and in no other way.

To make a probatory puncture the following should be observed: The patient is made bare to the waist and the site for puncture is cleansed with ether and 1–1,000 bichloride solution. The child is held firmly in the lap of its nurse and the arm of that side which is to be attacked is raised high and kept in this position, thereby securing a larger intercostal space. The physician firmly presses the tips of his left index and middle fingers into the selected space as a guide (not lower than the eighth interspace) and with the right hand, armed with a clean syringe and a rather large needle, punctures the interspace midway between the finger tips. The needle should be introduced from one to two inches, as the case may be, and the piston drawn out. The needle may now be pushed slowly forward or it may be slowly withdrawn. Lateral movements are not permissible unless the needle is in a pus cavity, for fear of tearing the lung tissue and producing pneumothorax or subcutaneous emphysema, several instances of which have come to my notice.

If all signs point to fluid and none is found, a second and third puncture may be made. If the needle enters a pus sac, pus will show, if it is only a drop. Should the needle be arrested before entering a pus cavity or be pushed beyond a pus sac or enter dense adhesions or a new growth or a thick pseudomembrane (pus membrane), pus will not show. A gelatinous exudate or thick inspissated pus will not pass through a very fine needle. A serous exudate mixing with a few drops of a disinfecting solution within the syringe may cause the aspirated fluid to look turbid and be mistaken for seropus, therefore the exudate removed should be examined under the microscope.

When the needle is withdrawn the puncture wound is at once secured with sticking plaster or thin rubber tissue made sticky by means of a drop of chloroform or ether. Puncture on the right side should be made so as not to injure the diaphragm or liver. If the puncture is made not lower than in the eighth interspace, such injury is improbable, as the liver and diaphragm are pressed downward by the weight of the exudate. If punctures are made in the manner described, there is not the slightest danger of infecting the thoracic cavity thereby. When a serous exudate becomes pus it is through infection from within.

When the presence of pus is shown by the needle, the treatment indicated is that of any abscess, whether it be unilateral, bilateral, free, or localized. A deep lung abscess with adhesions of both pleuræ is treated like a localized empyema. In abscess of the mediastinum we find a fluctuating tumor at the border of the sternum. In purulent pericarditis we should strike pus over a pyriform præcordial dull area with no evidence of cardiac shock. Occasionally the symptoms of purulent pericarditis are very obscure and misleading. A peripleuritic abscess of metastatic origin may be mistaken for empyema.

Lung abscess, lung hernia, thoracic new growths, and echinococcus of the thorax have been observed in children and mistaken for empyema.

Very interesting from a diagnostic and practical point of view are cases of multilocular pyothorax. In these cases the pyothorax is readily ascertained with the needle, but the multilocular and encapsulated pus sacs are first recognized during or after the operation, and make incision in various places necessary. The following case has come under the writer's notice:

A young lad had contracted amœbic diarrhœa in Central America and come North for treatment. There was flatness over the posterior aspect of the thorax on both sides, and the liver dulness was enlarged. A puncture through the eighth interspace on the right side gave pus of a chocolate brown color. A puncture at the seventh interspace of the same side gave a clear watery liquid, and the same watery effusion was found on the left side. The condition was clearly one of hepatic abscess which had perforated through the diaphragm into the thoracic cavity and was encapsulated. In addition there was hydrothorax of both sides.

The pulsating character occasionally observed in empyema is due to forcible heart action.

Termination.—Empyema in children usually ends in complete recovery if operated upon in time. When the lung expands and the pus cavity heals by granulation, a thickening of the pleura with adhesions results, as shown by slight dulness and diminished breathing over the affected side. In some cases a fistula will remain for a considerable length of time after operation, with ultimate recovery, or death ensues from tuberculosis, amyloid degeneration, or exhaustion.

Treatment of Pleuropneumonia.—The management of pleuropneumonia is the same as in pneumonia. When fluid is suspected and found by puncture, its removal (if pus or seropus) is immediately indicated. (See Treatment of Empyema.) If only clear serum is found, its removal by aspiration or incision through the intercostal space is indicated only in urgent dyspnœa. When puncture reveals a turbid fluid containing pus elements, a single incision in the intercostal space will let out the fluid, and a shred of iodoform gauze may be introduced into the pleural cavity to act as a drain. This procedure gives immediate relief, and the infant will be in a better condition to stand other operative interference (resection of a rib) should such become necessary.

In pleurisy the patient receives a warm mustard bath and a stiff dose of calomel and is put to bed. A cold compress is placed around the chest and renewed every hour or two. The diet is the same as in pneumonia. Although medication plays no rôle in the management of pleurisy with serous effusion, it is an undoubted fact that some cases do remarkably well under the administration of sodium salicylate (three to five grains four times a day). If malaria or syphilis is suspected as an underlying condition, iodide of potassium may be given per rectum, or the syrup of iodide of iron by the mouth, or quinine by the mouth.

The removal of fluid by aspiration or incision and drainage is indicated only when its massive accumulation endangers life from pressure upon the heart and lungs. If no absorption of fluid takes place after four weeks, the removal of a few ounces by aspiration appears to start spontaneous absorption.

When tuberculosis is suspected as an underlying cause, the young patient should lead an outdoor country life with the hope of throwing off the disease.

Treatment of Pyothorax.—Resection of a portion of a rib under anæsthesia and drainage of the abscess cavity is the treatment for empyema. Irrigation of the abscess cavity is not usually practised unless the pus is foul and stinking. If the patient is in collapse, anæsthesia is dangerous. In such cases it is better to cut rapidly through the intercostal space and relieve pressure by allowing some of the fluid to flow out. Hypodermic stimulation and enteroclysis may tide the patient over the critical period and subsequently resection of a rib may be done under ether in the usual way.

CHRONIC EMPYEMA necessitates further surgical treatment, after which the patient should be sent to the mountains, to the seashore, or to a convalescent home for *fresh air treatment* until the discharge ceases and the wound is closed. Patients should not be detained in city hospitals for any length of time after operations for pyothorax, as recovery is more rapid in the country or at the seashore.

Where operative interference is not resorted to, recovery may take place:

1. By perforation into a bronchus with expectoration of pus.
2. By perforation between two ribs, usually in the fifth interspace, or both these conditions may be present.
3. Recovery by gradual absorption of a small exudate of pus. Such recovery is rare.

A perforation into a bronchus may exist without allowing the exit of pus until intrathoracic pressure has been diminished by aspiration or incision. An external perforation may be cribriform, and a sound introduced may strike a rough rib (denuded of its periosteum by pus erosion), suggesting caries of the spine or rib. The pointing external pus sac may be pulsating in character. Perforation into the œsophagus has been reported, also cases of perforation through the diaphragm, the pus passing down behind the peritonæum as in cases of psoas abscess.

Secondary abscesses following pyothorax are a constant occurrence, such as otitis media, purulent pericarditis, phlegmon of cervical region, periostitis, purulent meningitis and peritonitis, abscesses of the scalp, gluteal region, eyelids, etc. Such secondary pus deposits are found in cases that have been operated upon as well as in neglected cases.

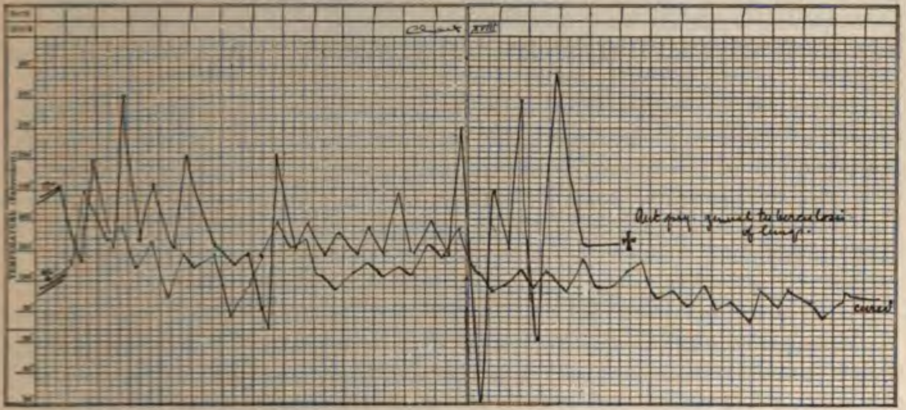

FIG. 66.—FEVER CURVE IN TUBERCULOSIS OF LUNG AND UNRESOLVED PNEUMONIA COMPARED IN CASES OF EMPYEMA.

As a rule the pleuritic exudate is in contact with the general circulation, as shown by the presence of drugs (chemicals) in the exudate.

The reinflation of a collapsed lung exposed to the pressure of the atmosphere through an opening in the pleural cavity is a paradox.

The Significance of Fever following Operations for Pyothorax

It may be stated that a completely apyretic course after empyema operations is exceptional. Assuming that in a given case of pyothorax the proper surgical procedure has been accomplished, we might expect, where the temperature has been high before operation, a fall of temperature and a normal or nearly normal temperature curve during convalescence. It is well known, however, that in a large number of cases a rise from the normal takes place at once or at various times during the further course of the disease, and as this fever temperature almost invariably indicates an extension of the disease or a complication of some kind, grave or trivial, it becomes a matter of great importance to correctly interpret such fever and remove any source of irritation if present, and, if possible, to remedy it before the patient is exhausted. The correct interpretation of fever after an empyema operation is in some instances extremely simple and in others extremely difficult, and it will not suffice to inquire simply into the matter of drainage and, if such appears satisfactory, to overlook other factors equally important.

The following are some of the causes for fever temperatures after operation for pyothorax:

Faulty drainage, slipping of a drainage tube into the thoracic cavity, intoxication with iodoform or carbolic acid, retention of urine, constipation, secondary extrathoracic abscess, eruptive fevers, wound infection, malarial fever, extension of the original inflammation to the other side or to other parts, unresolved pneumonia, coexisting tuberculous bronchopneumonia, nephritis as a complication, deep seated multilocular abscess, mild or severe general sepsis, and irritation from a drainage tube too long in place.

Thus a rise of temperature may mean very little, *but it always indicates something which we should endeavor to locate and correct.* The successful management of pyothorax is not alone a matter of incision and drainage, but calls for accurate clinical investigation and observation. A carefully kept record of temperature furnishes valuable evidence as to the underlying cause of fever.

WHOOPING COUGH; PERTUSSIS

This is a contagious disease due to a microorganism of unknown nature which probably finds foothold in and about the larynx and by its presence provokes a spasmodic reflex cough. It attacks children of all ages, and young children are particularly susceptible. If, after an exposure, two weeks pass without the development of a cough, the probabilities are that the disease has not been contracted. The *average* duration of the spasmodic stage is one month. It is not definitely known whether or not personal contact is necessary for infection. It starts as a catarrhal bronchitis, then turns into whooping cough with vomiting spells, and gradually diminishes in severity. After subsiding, it may start up again after a so-called fresh "cold," and last for from three to four months, particularly in winter.

There are no characteristic physical signs by which we can diagnosticate pertussis, except the "whoop." In infants whooping cough is often fatal; in children over four years it is seldom fatal. During the paroxysm there is severe heart strain, and a small number of the patients have chronic emphysema of the lung after recovery. In others the vesicular emphysema is not permanent.

The complicating phenomena and clinical varieties are: Mechanical visible hæmorrhages; bronchopneumonia and emphysema with and without fever; convulsions (asphyxia or intracranial hæmorrhage); indigestion, diarrhœa, vomiting; heart strain with albuminuria; paralysis in whooping cough of cerebral or peripheral origin (infrequent); stomatitis and sublingual ulcer. Sublingual ulcer may be due to the friction of the tongue against the teeth or it may be of contagious or parasitic origin.

Management.—The best treatment for whooping cough is the fresh air treatment.

Children with pertussis must be quarantined, but not confined to the house. The patient must live out of doors. A warm place at the seashore is the best location. The writer has known violent whooping cough to cease in three days on board an ocean steamer. If possible, the children should be changed from one cool sleeping room to another. The rooms in which they are confined should be well ventilated at all times day and night, and the air should not be vitiated by burning a "cresolene" lamp. The nasopharynx should be lubricated and kept clean by instilling mild salt water solution into each nostril four times a day, or by spraying albolene into the nose and throat.

The only drug which has given the author any satisfaction in treating whooping cough is antipyrine, of which one, two, or three doses (gr. i, ii, or iii) are given at night. Opium or belladonna may be given at the same time in exceptionally violent cases. In complicating bronchopneumonia with much secretion, camphor and hyoscyamus as a stimulant and expectorant may be given, also warm baths. Systematic compression of the thorax (artificial respiration) aids in expelling the secretions and is indicated in cyanosed children. For the management of convulsions in whooping cough, see Convulsions.

A paroxysm of whooping cough can be cut short by pressing the lower jaw forward and downward, as in asphyxia. Mother, nurses, and other attendants should be instructed in its use in order that the oncoming attacks, especially at night, may be arrested. Ozone inhalations in whooping cough have been employed. Such inhalations undoubtedly have a distinct curative effect as regards the duration and severity of the disease.

The following quotation is from a communication on the subject (*Transactions of the American Pædiatric Society,* 1892): Seven cases of pertussis were treated with ozone inhalations. The ages of the children ranged from eighteen months to seven years. Each case was well marked and of average severity. The cases were first treated in the second and third week of illness, at which time the paroxysmal cough is well developed. Two to three inhalations of fifteen minutes each were given daily, and all the cases were discharged after two weeks' treatment, except one case which was treated four weeks. No drugs were given, but salt water was dropped into the nose three times a day. The improvement became manifest after the first three to four inhalations. The children slept better during the night after inhaling ozone, and the youngest child under observation usually went to sleep after each inhalation. Unfortunately an efficient ozone generator is too expensive for general use in the homes of patients."

In very severe cases of whooping cough with frequent spells, much vomiting, and rapid loss of flesh and strength, *intubation* may be tried after all other rational treatment has been unavailing.

Pseudo, or False, Whooping Cough.—A throat cough with a whoop is a frequent sequela of influenza and yields promptly to local treatment. Cauterization with 2 per cent nitrate of silver solution and albolene or salt water spray through the nostrils into the pharynx are to be employed.

THYMUS GLAND; ENLARGEMENT AND ABSCESS

The thymus gland is situated in the anterior mediastinum; its function is unknown. It is small in the new-born, increases in size up to the end of the second year, remains unchanged until about the end of the tenth year, and diminishes in size until puberty, when it entirely or nearly disappears. When the thymus gland is enlarged it gives a substernal dulness on percussion, which is more readily elicited when the child is held horizontally, face downward, and percussion is practised from underneath. This dulness may also be due to enlarged peribronchial glands, in which case the predominance of percussion dulness is usually on one side, and other swollen lymph nodes are present in the lower region of the neck. The thymus gland may be present as an arched elastic swelling in the median line above the sternal notch. It may become hyperæmic or hæmorrhagic from the various causes which induce congestion, and it may suppurate or participate in a tuberculous process.

Enlargement of the thymus interferes with respiration and circulation. It may give rise to an inspiratory stridor often mistaken for laryngospasm. Sudden death from an enlarged thymus may have for its cause compression of the air passages or compression of the large vessels leading from the heart. These deaths are a mystery without a post mortem examination. The following case will give a fair idea of "sudden death in a case of enlargement of the thymus." Intra vitam the infant was occasionally slightly cyanotic and had spells of rapid and laborious breathing. On two occasions it had convulsive seizures. Auscultation revealed a loud systolic murmur at the base of the heart with the valve sounds clear and distinct. The murmur was not transmitted in any direction. The infant died and the autopsy showed, as was suspected, a large thymus gland measuring two inches in length and one inch across. The lower pole of the gland compressed the large vessels in such a way as to cut off the circulation.

A case of thymic tracheostenosis with substernal abscess was observed in a girl of two. The enlarged thymus gland could be mapped out by percussion. No improvement took place as regarded embarrassed respiration after administering mercuric inunctions and potassium iodide for about four weeks. Subsequently a rise of temperature was noted and the substernal percussion dulness became more marked. An x ray picture showed a dense and a light shadow. Thymic enlargement and abscess formation were suspected and operative interference was decided upon. The child died under chloroform anæsthesia after the first few whiffs. The autopsy revealed a very large thymus gland and abscess.

Treatment.—If enlargement of the thymus can be detected or is suspected calomel may be given in divided doses followed by a saline cathartic or potassium iodide (ʒij ad ℥j) may be administered by local inunction twice a day. In the event of an acute attack of suffocation, tracheotomy and intubation may be thought of. Resection of a part of an enlarged thymus gland and the removal of the entire gland has been done and the thymus has also been sutured to the sternum.

ENLARGED BRONCHIAL LYMPH NODES

The rational signs of enlarged bronchial lymph nodes are those of compression, i. e., pain, dyspnœa, cyanosis, and œdema, but all such characteristic signs may be absent, as the following case will show: A girl of four was admitted into a children's hospital with the diagnosis of bronchitis. There was no elevation of temperature, no pain, no dyspnœa, and the heart and kidneys were free. A few râles could be heard on auscultation over the sternum. On the morning following her admission she was playing with other children in the ward when she suddenly began to complain of pain in the neck, and almost immediately became cyanotic and asphyctic. As a large calibre O'Dwyer tube did not relieve her dyspnœa, a low tracheotomy was performed also, without giving relief. The obstruction was evidently in the lungs, and she died in a few minutes. At the autopsy both bronchi were found plugged with a cheesy material which came from a tuberculous bronchial lymph node situated above the bifurcation of the trachea, which had perforated and ruptured into the trachea. As long as the child was under our observation there were no symptoms pointing to such a condition, and the cheesy gland was in an unfavorable position for surgical interference. The specimen was presented to the American Pædiatric Society at Washington, D. C., in May, 1900. When a diagnosis can be made, general hygienic management and the administration of potassium iodide are indicated.

DIPHTHERIA

INTRODUCTORY REMARKS

Diphtheria is an acute infectious and contagious disease caused by the Klebs-Loeffler bacillus. The primary manifestations can be recognized at the portal of entrance in the nasopharynx or elsewhere. The secondary, or constitutional, symptoms are due to the absorption of toxines produced by the growth of microbes upon or within the mucous membrane, wherever lodged. The contagium is principally in the secretions from the nose and throat. For the method of preparing smears and glass preparations and swab cultures, see Laboratory Aids to Diagnosis.

Diphtheria is communicable by direct or indirect contact as long as the bacilli are present in the various discharges from the throat, nose, ear, and other parts, and any unhealthy condition of the nose and throat predisposes to the infection.

The **incubation period** varies, and it is possible for the germs to remain *dormant* in the mouth for an indefinite period and finally infect the body whenever the mucous membrane is *weakened*, *receptive*, or *damaged*. The formation of a pseudomembrane is the most constant lesion in diphtheria, but virulent infection may take place without membrane formation.

The acceptance of the Klebs-Loeffler bacillus as the specific causative factor in diphtheria has made it necessary to give a name to membranous sore throat in which the bacilli are not found, but in which various cocci are invariably present. This variety is at present called *pseudodiphtheria;* and some modern textbooks therefore speak of *primary and secondary true diphtheria*, and *primary and secondary pseudodiphtheria*.[1] Although the mortality of pseudodiphtheria is not so high as that of the Klebs-Loeffler variety, still it is a very dangerous disease, and may be followed by paralysis and death, and inasmuch as we *cannot distinguish clinically one variety from the other*, and *inasmuch as valuable time is lost in waiting for a culture test*—which, by the way, *is not always conclusive or final*—every attempt to adjust treatment in accordance with the bacteriological classification must be looked upon as a failure in the present state of our knowledge.

While fully cognizant of the scientific and practical value of bacteriological research, we must confess that failure to clear up doubtful cases by cultures, and in good time, is a daily occurrence. Moreover, it is well known that in localities in which diphtheria is endemic the majority of cases eventually prove to be a mixed infection; consequently the physician will be wise to look upon all *acute throat affections in children, attended with fever and swelling of the lymph nodes*, or upon *membranous rhinitis without fever*, or upon *hoarseness with slow progressive stenosis, as suspicious of diphtheria, and treat them accordingly*. The bacteriological diagnosis of diphtheria may be made in several hours by means of Loeffler's glucose blood serum and the incubator; still, to wait even a few hours for a bacteriological diagnosis is not wise. The culture test should be looked upon as a *confirmative one*, and nothing more. In tuberculosis, gonorrhœa, malaria, etc., the microscope establishes a positive diagnosis, after which we may institute rational treatment, but in diphtheria our *specific treatment* comes *first*, the *microscope afterward*.

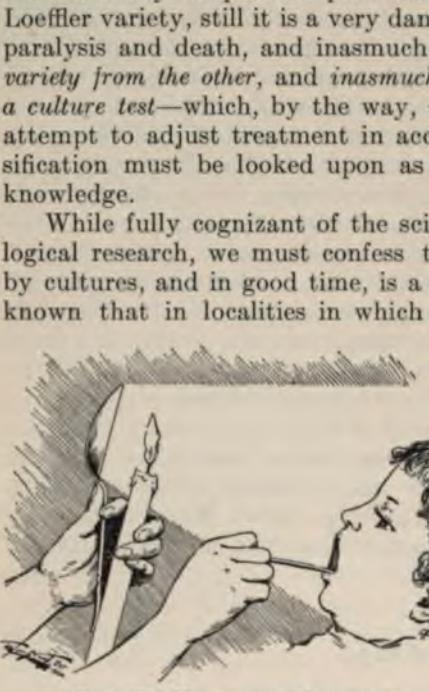
FIG. 67.—HOUSEHOLD REFLECTOR. (From Pædiatrics, 1901).

Another point worthy of brief consideration is the difficulty of distinguishing clinically between *follicular tonsillitis* and *diphtheria*. As recognized by Dr. A. Jacobi more than thirty years ago, no amount of experience will enable the physician to distinguish between the two affections. *What looks like a tonsillitis to-day may be a virulent diphtheria to-morrow;* such cases should be isolated and treated as diphtheria. If a subsequent examination proves the contrary, no harm has been done. In practice, the physician who acts in accordance with these views will have more success in the management of such cases than he who poses on an ultra-scientific pedestal, waits for the culture test in diphtheria, and writes death certificates.

Clinical and Characteristic Varieties of Diphtheria.—Diphtheria runs its course as a mild case, a septic case, or a stenosis case; but we can never determine at the onset whether a case will progress favorably or terminate fatally. Its characteristics are the formation of a membrane, the presence of fever, indurated lymph nodes in the neck, sepsis, and laryngeal stenosis. In membranous rhinitis and membranous laryngitis there is usually no fever.

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[1] Another form of pseudodiphtheria is Vincent's angina with superficial and deep necrosis of tissue.

The following clinical varieties will be met with in practice:

1. So-called follicular tonsillitis.
2. Primary diphtheria of the tonsils and pharynx.
3. Primary nasopharyngeal diphtheria.
4. Primary nasal diphtheria; also called membranous rhinitis, or diphtheria larvata.
5. Primary laryngeal diphtheria (membranous croup).
6. Diphtheria without membranes (simulating simple angina), and a virulent form without membranes.
7. Secondary diphtheria, following measles, scarlet fever, pertussis, etc.
8. Diphtheria in young infants.

Symptoms and Diagnosis.—The onset may be gradual or sudden, with fever, vomiting, anorexia, fœtid breath, pain, delirium, dysphagia, and tumefaction of the lymph nodes. *The membrane* in true as well as in pseudodiphtheria presents many variations from a thick and cheesy, to a thin and veillike deposit; occasionally the surface appears as though smeared over with pus, and frequently we notice an *infiltration* of the mucosa without detachable membrane. The latter form may persist for weeks if *antitoxine* is not used, and if the *local treatment is at all harsh and irritating.*

Virulent septic diphtheria without membranes, with very high fever, incessant vomiting, and a very rapid pulse, with or without delirium, is fatal. The throat is of a dusky brown red color.

Diphtheria in the anterior nares gives very few symptoms: a running nose, excoriation at the nostrils, and snuffles, but no fever. This may go on for weeks, when an extension into the nasopharynx or larynx is manifest by other additional or subjective symptoms. The Germans call this form *diphtheria larvata*, and in all such cases a culture will show the true state of affairs. Ordinary thrush (*Oidium albicans*) can hardly be mistaken for diphtheria, but *diphtheria of the mouth may be mistaken for stomatitis*, and patches of leptothrix are frequently called diphtheria, particularly when associated with tonsillar inflammation, painful and swollen lymph nodes, and fever. Leptothrix patches will be found protruding from the crypts or margins of the tonsils, and are very difficult to scrape away; they also resist the action of various caustics to a remarkable degree, and sometimes make repeated scrapings and cauterization necessary. Mucosis of the uvula and palate may be mistaken for diphtheria and a bacteriological test will distinguish between diphtheria and the tonsillar ulcer of Vincent.

Prophylaxis and Immunity.—Although the contagiousness of diphtheria is well established, it must be borne in mind that it is not so readily transmissible as scarlatina and some other infections. Moreover, that it can readily be prevented. At the present time the prevention of the spread of the disease is quite beyond the control of the central government. For information on municipal control, school hygiene, school inspection, isolation hospitals, and general and local disinfection, the reader is referred to the various articles on prevention of the spread of contagious diseases in this book.

PERSONAL PROPHYLAXIS AND THE NASOPHARYNGEAL TOILET.—*The proper management of the nasopharynx in children and adults is one of the most important subjects in practical medicine.* The nasopharynx is the usual site of entrance of diphtheria, and to this locality the preventive measures must be directed. In a contribution to the proceedings of the New York Academy of Medicine in 1884 the writer showed that chronic nasal catarrh, adenoid vegetations, enlarged tonsils, and carious teeth favored diphtheria infection, and that *in the absence of such conditions the instillation of a weak salt or alkaline solution into the nose morning and evening would prevent diphtheria in those exposed or prone to contract it.* The general practitioner should see to it that in all children coming under his professional care adenoids, if present, are removed by the post-nasal forceps and curette, that hypertrophic tonsils are resected, and that carious temporary teeth are filled or extracted.

The NASOPHARYNGEAL TOILET consists in the instillation into each nostril, by means of an ordinary teaspoon, of a spoonful of salt water, 1 per cent, morning and evening (at bedtime and on rising), as the children lie on their backs, with the nose tilted up and the mouth open. The liquid does not wash through at once; some of it remains in the various recesses of the nasal cavity, and is eventually sneezed out or swallowed. In this way putrescible matter and bacteria are washed away (mechanical antisepsis). Where additional chemical antiseptic action is desired, a 1 to 5,000 mercuric bichloride solution, or Labarraque's solution, 10 per cent, or a rose colored permanganate of potassium solution should be employed.

The nasopharyngeal toilet, carried out in the way described, is indicated for (1) all healthy children from one year up who live in infected localities, and (2) for all healthy children directly exposed to diphtheria infection. It is also the *best method of local treatment in all cases of diphtheria*, in which instances it should be resorted to every two hours; moreover, it is the most satisfactory *local routine treatment* in all diseases in which diphtheria frequently sets in as a complication, e. g., in scarlatina, measles, and pertussis; furthermore, it is a necessity *before* and *after* tonsillotomy and all operations on the nose and throat. This method is far superior to gargling, and in many forms of reflex cough, also in cough of tuberculous origin, it is far superior to nauseating expectorant mixtures, and in all forms of febrile disease in which the nasal secrètion becomes dry, crusty, or hardened, half a teaspoonful of salt water instilled into each nostril affords much relief. The nasopharyngeal toilet not only does not provoke middle ear and accessory sinus complications, but, according to the experience of the writer, apparently prevents them.

IMMUNITY.—Specific and direct immunity is secured for those exposed to diphtheria by means of *antitoxine*. *The period of immunity varies from three to six weeks, which is sufficient for all practical purposes in times of epidemics or house infection.* Aside from the reports which come to us from abroad, we have reliable reports from various hospitals for the treatment of children's diseases throughout the country which go to prove the absolute value of antitoxine as an immunizing agent. The immunizing dose is 500 units, and all exposed children should receive this quantity.

The curative and immunizing properties of diphtheria antitoxine are established facts. According to recent careful and unbiassed investigations, the mortality in primary diphtheria has been reduced two thirds, and the protective power of diphtheria antitoxine extends over a period of from three to six weeks or more. With an agent so powerful for good at our command, the question naturally arises: Do we or do we not make the best use of our new therapeutic acquisition? The writer suggests[1] a new use for this agent by advocating an *immunizing injection for young school children once or twice during the school year*, for instance, in November and February, with the hope of preventing infection from primary diphtheria or croup, and, furthermore, with the hope of lessening the mortality of the severe forms of scarlatina and measles, a large percentage of such cases being complicated by diphtheria from the beginning or in the course of the disease.

It is well known to the experienced medical practitioner that cases of scarlatina which show a complicating diphtheria from the onset are of a very grave type. In such cases we often observe an overwhelming sepsis with delirium and circulatory failure. In scarlatina with complicating diphtheria setting in after the first week the septic symptoms are never so acute and urgent.

In measles we observe diphtheria as an early or late complication, but the most important diphtheria complication of measles is diphtheritic croup. The mortality from scarlet fever plus diphtheria and from measles plus diphtheria is quite high, and the writer is of the opinion, based on clinical experience, that this mortality can be markedly reduced by means of protective inoculations of diphtheria antitoxine. Such prophylactic management will have no effect upon pure and simple scarlatina or measles, but will certainly create more or less immunity as regards grave diphtheritic complications, or, in other words, *turn a grave disease into a milder disease*.

Treatment.—(*a*) By antitoxine. (*b*) Supplementary treatment.

(*a*) ANTITOXINE. Dosage. Indications for.

The treatment for diphtheritic inflammation consists in the *early* and *proper* administration of *reliable* antitoxine, supplemented by the *nasopharyngeal toilet*. The time for discussing the pros and cons of antitoxine treatment is past; the specific curative power of this remedial agent is an established fact. *Behring's* contention, that if antitoxine is used early the mortality from diphtheria will not exceed 5 per cent, is borne out by the reports of competent clinicians all the world over. Opposition to anything so radically new as *Behring's discovery* is one of the associating features in the evolution of scientific medicine. Vaccination and antiseptic surgery stand in evidence of this fact. Any practitioner who studies the collective investigation reports for 1896 and 1897, on antitoxine for diphtheria and croup in private practice, issued by the American Pædiatric Society, and fails to use antitoxine because he "*does not believe in it*," should not be entrusted with the management of a case of diphtheria, and the practitioner who *thinks* a case is mild and waits for severe symptoms before using antitoxine, utterly fails to grasp the situation and will frequently be disappointed.

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[1] *Transactions of the American Pædiatric Society*, 1903.

Indications for Antitoxine.—Antitoxine is indicated in doses of 500 units for immunizing exposed persons, and in doses of from 2,000 to 4,000 units to combat the disease.

2,000 units for very young children.
2,000 to 4,000 units for older children.
3,000 units in croup cases.

It should be employed at the earliest possible moment, and the dose repeated the following day and subsequently as often as is necessary. The dosage is expressed in units, and not in the serum quantity; the preparation having the highest number of units in the least quantity of serum, and from an *absolutely reliable source*, is to be preferred. The injections are made in any region where a fold of skin can be picked up—the skin, the hands of the physician, and the syringe must be *clean*. Any syringe will answer, but the best syringe is one made entirely of glass, and it is now obtainable in the shops.

The writer also advises the injection of a curative dose of antitoxine in every case of *scarlet fever* coming under his notice, because this disease is frequently complicated with diphtheria, and he also administers a curative dose in cases of *measles* and *whooping cough if the throat shows the slightest appearance of a pseudomembranous patch.* It would appear rational to give an immunizing dose in puerperal cases where a diphtheria case exists in the same house; also to children on whom an operation is to be done in the nose or throat and where the culture test shows the presence of diphtheria bacilli without clinical symptoms. Antitoxine is also indicated in *diphtheria of the eye*, which is, fortunately, very rare. The more common croupous conjunctivitis is not to be confounded with eye diphtheria, in which the eyelids are phlegmonous and hard.

The antitoxine rash, which is noticed in a certain number of cases, has no very characteristic features and may readily be mistaken for scarlet fever or measles rash; its appearance is usually not heralded by a rise of temperature and increase of other symptoms. As regards the combined use of *antistreptococcic and antidiphtheritic* serums in cases of mixed infection, no positive advice can be formulated at the present time.

(*b*) LOCAL SUPPLEMENTARY MANAGEMENT.—The local treatment of diphtheria must be *mild*. Swabbing the throat in diphtheria is harmful, and should not be practised. Solutions used as gargles do not reach the nasopharynx; the spray is only to be employed in cases in which force need not be used, e. g., in docile children. The best way to cleanse the nasopharynx is to pour the liquid into the nose from a spoon; if the nose is partly or almost completely stopped up, a blunt piston syringe or a Davidson's or fountain syringe must be employed. In septic cases the irrigation is best done as the children lie on the side, in order to avoid any sudden strain and collapse. For the majority of cases, instillation by means of a spoon will suffice. This may be done every hour or two, and if necessary day and night, according to the severity of the case. If syringes are used, the stream should be directed horizontally, and not upward. Syringes should not be used if bleeding follows each irrigation.

The following liquids may be employed: Salt water, a teaspoonful to a pint, permanganate of potassium, a rose colored aqueous solution, mercuric bichloride in water, 1 to 10,000, listerine, 1 to 10, lime water, alum water, 5 per cent, Labarraque's solution in water, 1 to 20, 2 per cent ichthyol solution in water.

Peroxide of hydrogen has shown itself to be an active irritant, and aids the spread of diphtheria; it should therefore not be used in this disease unless largely diluted. Any of the above mentioned liquids may be used as a gargle when children are able to gargle. *Excoriations* at the angles of the mouth and at the nostrils usually heal under camphor ice.

Antitoxine, with mild local treatment and judicious stimulation, will suffice for ordinary cases seen in good time; but as cases will come under observation in which valuable time has been lost in temporizing with household remedies, the physician will not be spared the management of various *complications*, which will now engage our attention.

MEDICATION.—The local antiseptic power of a teaspoonful of medicine, as it glides over the tongue and down the œsophagus, is practically nil. The yellow chlorate of potassium and iron mixture and the mercuric bichloride mixture will not be necessary where antitoxine can be had, and should under no circumstances be given to a patient with an irritable stomach. As an aid to digestion the following mixture is efficacious:

℞ Ess. pepsin., ... ℥ij;
Acid hydrochloric, dil., ... ʒss.

M. S.: A teaspoonful four times a day.

In septic cases, five drops of the tincture of chloride of iron may be given every four hours.

STIMULATION.—Whiskey, American Tokay wine, champagne, coffee, strychnine, gr. $\frac{1}{60}$, three times a day; camphor, gr. $\frac{1}{2}$ to 1, three times a day; benzoate of sodium and caffeine, dose, gr. 1 to 3, also subcutaneously, dissolved in water; camphorated oil, 5 to 15 drops, subcutaneously. When the stomach is irritable, stimulating drugs may be given subcutaneously or per rectum.

FEVER.—High temperature can be reduced by cold and lukewarm sponge and tub baths. (See General Therapeutics.) To give an antipyretic drug regularly every two or three hours is very bad practice; one or two doses in twenty-four hours, particularly at night, are serviceable. From 3 to 10 grains of phenacetine with half a grain of caffeine, or lactophenin with caffeine in the same dose, may be given. Antipyrine is a safe antipyretic, and as it is soluble in water, from 3 to 7 grains may be given per rectum. In cerebral restlessness an ice cap is advisable. Quinine should never be given as an antipyretic in any but malarial disease.

VOMITING.—In cases of incessant vomiting stop all internal medication and give only 1 to 2 drops of tincture of iodine in sweetened peppermint water every hour or two or wash out the stomach.

DIARRHŒA.—In many septic conditions a mild form of diarrhœa may complicate matters. This can usually be checked, if necessary, by a diet of burnt flour gruel or cornstarch pap and by omitting milk food for a time. Should this not suffice, 5 grains of tannic acid or tannigen, given with chocolate, or ½ a grain of acetate of lead with sugar of milk, or ½ a grain of camphor with ⅛ of a grain of Dover's powder, will check the diarrhœa.

Albuminuria and nephritis are frequent complications of diphtheria. A stiff dose of calomel and jalap, and one or two warm baths a day to promote diaphoresis, will be the treatment in such conditions. In nephritis with dropsy, as a sequela of diphtheria, an infusion of digitalis may act as a diuretic by improving the circulation.

Convulsions.—Initial convulsions indicate intense infection or nervous reflex irritability, for which an enema, a warm bath, and hydrate of chloral, gr. iij, and potassium bromide, gr. v, are indicated, per os or per rectum. Terminal convulsions, indicating heart failure and cerebral inanition, give an unfavorable prognosis. A warm bath and stimulants are here indicated: 5 drops of camphorated oil and 5 drops of ether subcutaneously every few hours.

Dry Tongue.—The tongue is sometimes so hard and dry that pain and difficulty in swallowing result. For this condition glycerine and rose water, equal parts, applied with a brush, afford relief.

Pseudomembranous conjunctivitis is occasionally seen in severe diphtheria cases. This readily yields to ice compresses and the boric acid spray. In true *diphtheria of the eye,* in which the eyelids are much swollen and indurated, antitoxine must be used in large doses. Fortunately, as has already been said, this condition is very rare.

Otitis media, due to an extension of the septic process through the Eustachian tube, is frequently observed, but the earache is not nearly so intense as in ordinary otitis media, and rupture of the drumhead takes place readily. The ear should be cleansed with mercuric bichloride solution, 1 to 5,000, or a warm boric acid solution with cocaine, or menthol in sweet almond oil (ʒ½ to ʒjv) should be instilled. The drum membrane may require puncture.

Hæmorrhage from sloughing of the tissues is a very dangerous and distressing complication. If possible, the bleeding spot should be located by means of a strong light and directly cauterized with the actual cautery, lunar caustic, chloride of zinc, alum solution, or antipyrine and tannin. The styptic iron preparations are not so applicable, on account of the large grumous blood clots which invariably form.

Phlegmon and induration of the tissues of the neck, with indistinct fluctuation of cervical lymph nodes, are best managed by a large incision through the entire dense and thick skin down to the glands. The latter are usually in a friable, spongy state with little pus spots scattered through the tissue, and can readily be broken up by pushing a blunt director or dressing forceps through the capsule and sweeping it around in various directions in order to break up the necrotic tissue. Make one abscess cavity which can readily be drained by means of iodoform or bichloride gauze under a moist dressing. The neighborhood of such a diphtheritic and gangrenous wound occasionally has an erysipelatous appearance, which usually subsides under the application of cold lead lotion.

Paralysis and Ataxia Following Diphtheria

Postdiphtheritic paralysis may affect the general nervous system, the eye, ear, throat, etc.

Paralysis of the soft palate is not rare. A stationary palate, a nasal voice, and food regurgitation through the nose are the characteristic symptoms. For this condition, as well as for the *temporary locomotor ataxia* which is occasionally observed, we require fresh air, baths, massage, the interrupted current, and $\frac{1}{50}$ of a grain of strychnine, three times a day, by the mouth or under the skin. The antitoxine treatment has not made paralysis cases more frequent, nor does it appear to facilitate the recovery from such complications. A gradual paralysis of the respiratory muscles, including the diaphragm, as shown by a weak cry and rapid, superficial breathing, is a very serious condition to deal with, but may improve under stimulation and artificial respiration.

In addition to the general treatment just announced, the cold douche and artificial respiration may do good. Cardiac arrhythmia in the wake of infectious disease is not infrequent and is mostly due to myocardial involvement, for which rest, hygiene, and rational diet and stimulation are to be employed. *Sudden death from heart paralysis* gives no chance for treatment. In all cases of septic diphtheria, early and proper stimulation may prevent it.

The anæmia which is known to follow in the wake of diphtheria and other infectious diseases demands tonics, such as fresh air and iron. *Bronchopneumonia* and *lobar pneumonia, thrombosis of veins and arteries*, and other remoter complications will come under observation, and will call for proper management.

DIET.—Milk, Vichy, matzoon, kumyss, beef peptonoids, cornstarch, eggnog, custard, ice water, cream, farina, cocoa, eggs, raw meat, burnt flour soup, whiskey, California Tokay, coffee, tea, punch, iced champagne, pineapple juice, and tropon. The diet in diphtheria is of prime importance. The food should be nutritious and digestible. Forced feeding is proper in exceptional cases, but it is well to remember that children with febrile and septic disease have little desire for food, and that the stomach will resent all attempts at overfeeding. Somatose is soluble meat without taste or smell, and can be given with cocoa, milk, gruel, rice, etc.

For *rectal alimentation* we inject a mixture of whiskey, egg yolk, beef peptonoids, and warm water or somatose in oil emulsion.

Gavage will be indicated in exceptional cases.

In regard to the question as to when it will be safe to send children who have had diphtheria back to school, we should judge by the culture test. Whenever this test cannot be employed we should wait at least three weeks from the disappearance of clinical symptoms, during which time the nasopharyngeal toilet should be diligently carried out.

CROUP

In practice we recognize (1) a *croupy cough* without stenosis; (2) *a catarrhal or pseudocroup* with dyspnœa, and (3) *true croup*, in which the stenosis is progressive and frequently necessitates operative interference.

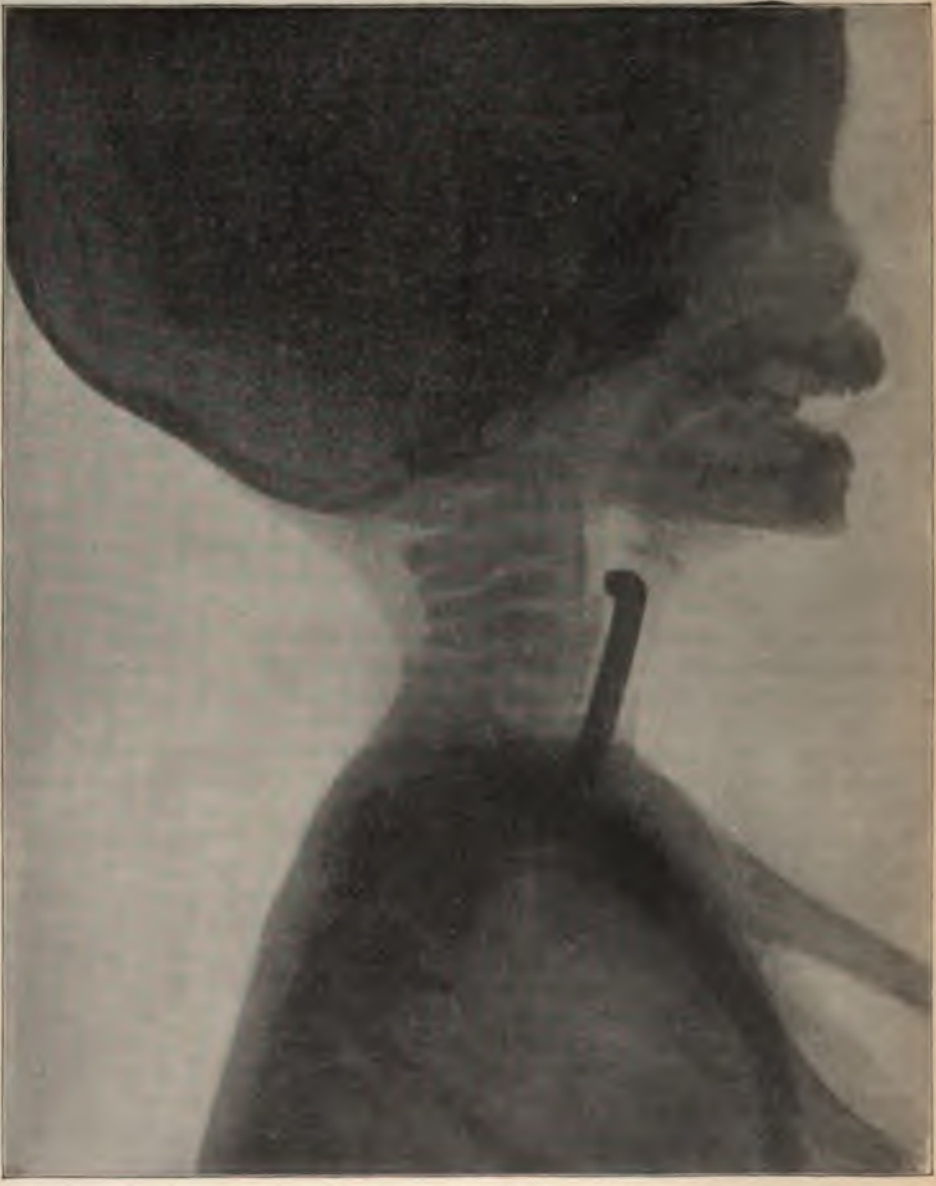

FIG. 68.—INTUBATION TUBE IN SITU. (Skiagram.)

The croupy cough is common in children with adenoid vegetations, follicular pharyngitis, or large tonsils; it usually begins at night and yields to the mildest treatment. A cloth wrung out of cold water, around the neck, salt water dropped into the nostrils, and a hot drink are all that is necessary for the time being, with subsequent curettage or cauterization of the swollen follicles in the pharynx. Emetics are not indicated, although very popular with that class of parents who delight in goose grease and turpentine.

As a type of *pseudocroup* with dyspnœa, the croup of measles is characteristic. Here we have to deal with catarrhal laryngitis or œdema of the glottis, which rarely goes on to complete stenosis; the treatment is the same as for "croupy cough." Only in extreme cases will local scarification of the œdematous tissues or intubation be necessary. *Adrenalin chloride* is capable of controlling œdema. It may be applied by means of a cotton applicator every hour. The so called *true croup* either is a primary membranous laryngitis or is secondary to diphtheria of the nasopharynx. *In primary membranous croup the pharynx is pale and the temperature normal, and the onset is never sudden; hoarseness, aphonia, and stenosis come on gradually*, whereas in pseudocroup the onset is generally sudden, the pharynx is usually congested, and there is fever. About 80 per cent of membranous croup cases are known to be cases of Klebs-Loeffler diphtheria; in about 20 per cent this bacillus has not been found. True croup should, therefore, be quarantined as diphtheria.

The secondary croup with stenosis is due either to an extension of the membranes downward or to the swelling and œdema of the tissues adjoining a diphtheritic patch. Urgent laryngeal stenosis, secondary to various forms of nose and pharynx diphtheria, is, therefore, *not necessarily membranous*, but the treatment is practically the same in both instances.

Treatment of Croup with Urgent Stenosis.—Before the advent of antitoxine the best treatment for true croup, before operation, was with *mercury* or *calomel*, internally, by inunction, or by fumigation, and it is well known to experienced physicians that intubation and tracheotomy gave better results when mercury had been administered. Mercuric bichloride, gr. $\frac{1}{12}$, was given every hour for one or two days, or 20 grains of calomel were volatilized over a lamp, under an improvised tent, every three hours for from twenty-four to forty-eight hours. The spray and croup kettle have very little value, and emetics in any shape are productive of evil, as they sap the strength of the patient. Now that we have specific treatment, we shall not discuss in detail our former management of croup cases, because the best treatment of croup, before operation, can be mentioned in one word—*antitoxine.* Here, again, I refer the skeptic to the report of the American Pædiatric Society on laryngeal stenosis, which tells the whole story, reflecting, as it does, the experience of hundreds of physicians and sifting the evidence in a judicial manner. Briefly, the report says: Before the use of antitoxine 27 per cent of intubation patients recovered; now 73 per cent recover. Sixty per cent of stenosis cases do not require operation if antitoxine is used in time, and an early use of antitoxine will lower the mortality of intubation cases still more.

In every case of acute progressive stenosis 2,000 to 3,000 units of diphtheria antitoxine should be administered at once, and the dose may be

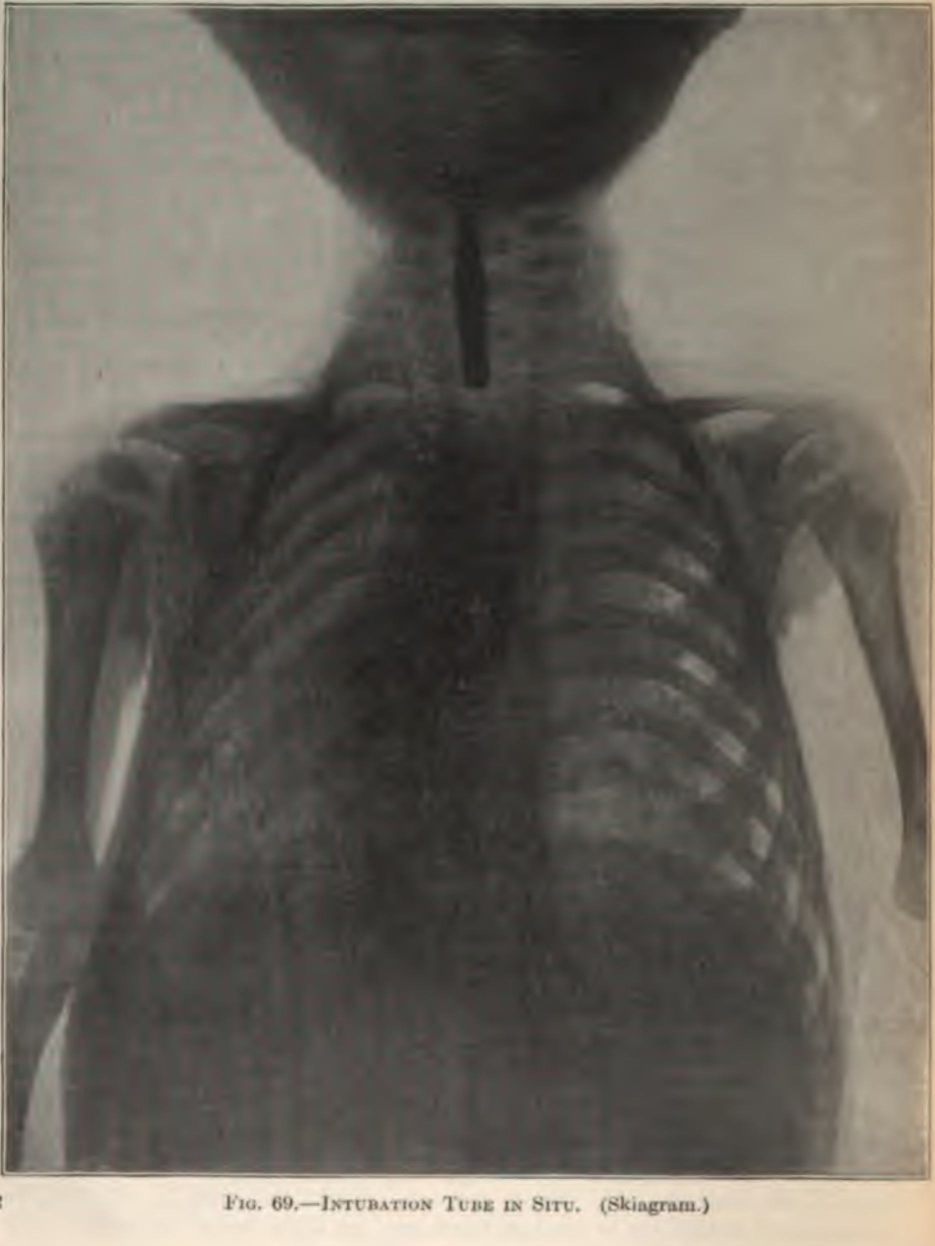

FIG. 69.—INTUBATION TUBE IN SITU. (Skiagram.)

repeated in from twelve to twenty-four hours, and so on, until relief is manifest. As soon as the stenosis becomes less urgent, and the cough somewhat loose, the main danger is over, and camphor, gr. ½, or spir. ammoniæ, aromat., gtt. x, may be given as an expectorant and stimulant, four times a day. The same management should be resorted to in secondary stenosis following scarlet fever, measles, pertussis, nasopharyngeal diphtheria, or so called tonsillitis, together with the nasopharyngeal toilet, as before described. When antitoxine fails to check a progressive stenosis, the time for operative interference is close at hand. The proper time for the operation is a matter of experience; the physician should not wait until the patient is cyanosed and the pulse intermittent.

INTUBATION AND TRACHEOTOMY

Intubation is the art of introducing tubes into the larynx and removing them at the proper time. In combination with antitoxine, intubation is one of the greatest blessings at the disposal of the physician. *Dr. J. O'Dwyer*, of New York, is the inventor of our present method of tubing for croup. The instruments he devised have been in general use since 1886, and although a number of modifications have been suggested, none has come to the writer's knowledge which is in any respect an improvement on those used in the original method, with the exception of Denhard's gag, which is universally used. Many of the modifications are useless or bad. The tubes now in use have a smooth coating of hard rubber, to prevent incrustation. The operation of intubation and extubation is not, in itself, difficult; but every one contemplating becoming a safe operator

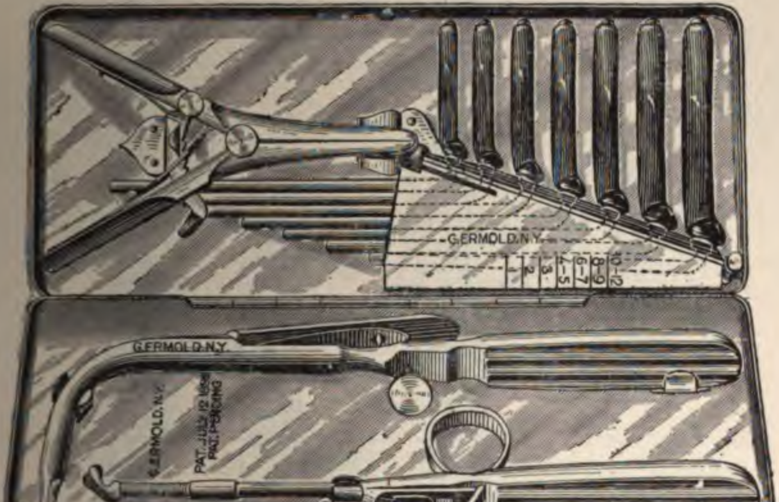

FIG. 70.—O'DWYER'S INTUBATION SET.

should practise the operation on the cadaver. Its *modus operandi* cannot be learned from reading. Colleagues with a short and thick index finger have some difficulty in learning to tube properly.

How to Operate.—Remove the child's clothes, except the undershirt, and wrap the child securely in a towel from the shoulder down, secured by safety pins. Place the child upright, facing the operator, in the lap of the nurse, who sits upright in a common straight backed chair. The arms of the patient are to be firmly held below the elbow; the child's legs are clasped between the knees of the nurse. The assistant stands behind the chair, holds the child's head firmly *between the palms* of his hands, and when the gag is inserted includes it within his firm grasp. The position of the child should be as though it hung from the top of its head. The operator now inserts his index finger, hooks up the epiglottis, and inserts the tube in the funnel-shaped entrance to the larynx by elevating the handle of the introducer. The tube is then gently pushed home. While loosening and withdrawing the obturator, the head of the tube is held in place by the tip of the index finger in the throat, and a gentle push may be given to place the tube well into the larynx. The introducer must be kept in the middle line, and the child must not be allowed to slip down in the nurse's lap.

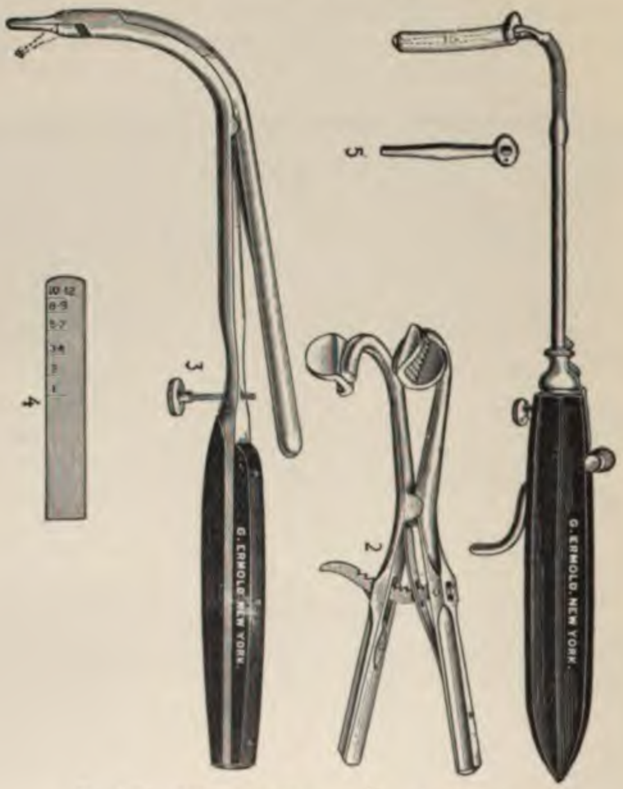

FIG. 71.—O'DWYER'S INTUBATION INSTRUMENTS.

The gag must be properly adjusted and firmly held. Any carelessness in carrying out these details will result in failure to introduce the tube.

It may be in place to dwell briefly upon some important points as regards *feeding and medication, duration of wearing the tube, intermittent intubation, the management of cases where the tubes have been coughed up, secondary stenosis from cicatrix, granulations, or œdema, the selection of special tubes for œdema of the epiglottis and venticular bands, retained tubes, etc.* A new tube should be used for each case. If the operator is in doubt as to the proper size, the smaller size should be chosen. The tube may be disinfected immediately before using, and a minute quantity of iodoform ointment may be used as a lubricant. When the tube is in the larynx, and not blocked by detached membranes, a characteristic moist rattle will be heard as the air is forced in and out in respiration. Before removing the gag, the left index finger is rapidly passed to the head of the tube to determine positively that the tube is in its proper place, then the string and finally the gag are removed. It is best not to use a string which is too strong to be broken, for in case it should become wedged in its eyelet, the string may be broken away with the index finger at the head of the tube to prevent dislodgement. If a detached membrane has been forced down, the child will become more cyanotic, whereupon the tube should be pulled out by its string and reintroduced after the detached membrane has been expelled by coughing. If a tube is coughed up after having been in the larynx a day or two, a reintroduction is not necessary until urgent symptoms

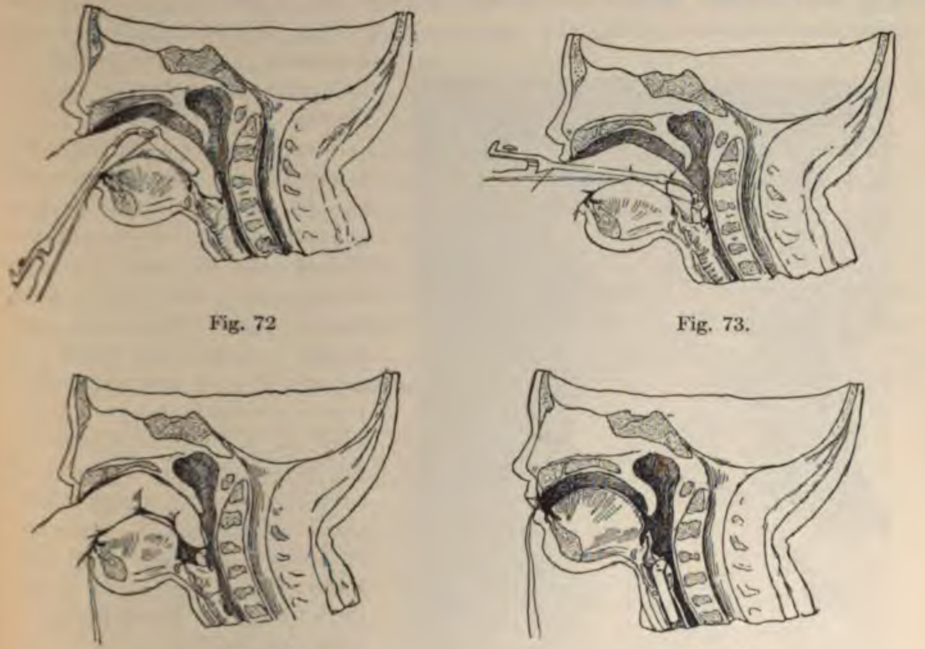

Fig. 72 Fig. 73.

Fig. 74. Fig. 75.

FIGS. 72-75.—TECHNIQUE OF INTUBATION (after Trumpp).

demand it, and if a child has great difficulty in swallowing food, the tube may, in exceptional cases, be taken out once a day for the purpose of proper feeding.

FEEDING.—Some children will swallow liquids without difficulty, others will swallow semisolids best, such as custard, scraped meat, ice cream, sponge cake soaked in milk, hard yolk of egg, farina with egg, somatose, matzoon, or ice. Most children will swallow well in the dorsal-horizontal posture. Forced feeding by means of a tube (gavage) may become necessary, the tube being introduced through the nose or mouth. (See Gavage.)

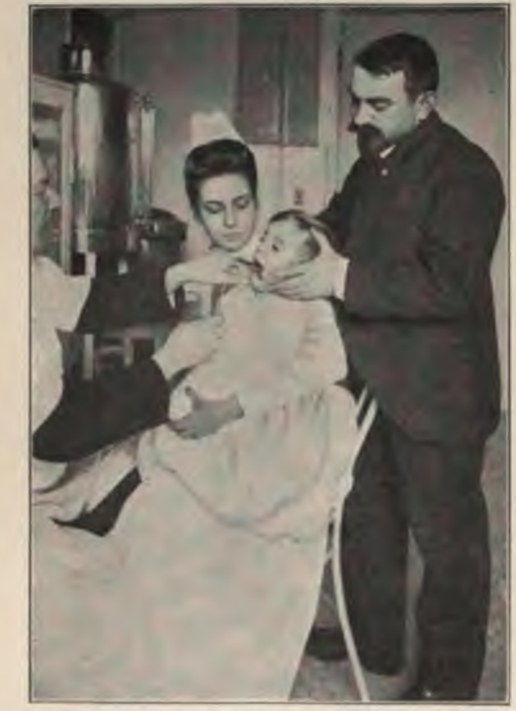

FIG. 76.—INTUBATION OF THE LARYNX.

MEDICATION. — Stimulants, heart tonics, and antipyretics can be given with the food or subcutaneously or per rectum. Tubes may be removed after two, four, or six days. Antitoxine has shortened this period very much. When it is noticed that a greenish mucopus is coughed up through the tube, it is time to remove it. To avoid pressure necrosis, a tube should not remain longer than six days. A moderate secondary stenosis after the removal of a tube may be relieved by a few five-grain doses of antipyrine.

HOW TO REMOVE THE TUBE.—Place the child in the position for intubation, as described above. Thrust the left index finger past the epiglottis, hook it up, and with the tip of the finger as a guide introduce the extractor tip into the tube lumen and get a firm hold on the tube by depressing the handle. The tube is raised sufficiently to get the tip of the index finger under its head, and by this combined manipulation the tube is lifted out of the larynx and out of the mouth. In introducing, stand before the patient; in extracting, sit before the patient. After removing a tube, it is desirable to be within easy call for some time, as some cases need re-intubation even after twelve to twenty-four hours. If re-intubation is not necessary within one hour, the operator may leave the patient, but be within easy call.

RETAINED INTUBATION TUBES.—Apart from ordinary "prolonged tube cases," a stenosis which occasionally persists in intubation cases is usually the result of traumatism, i. e., laceration during attempts at intubation, and pressure necrosis from badly constructed tubes that have been too long in the larynx and become roughened by calcareous deposit. Cicatricial stenosis or granulations will be found at the entrance of the larynx at the base of the epiglottis. Such cases require expert management, and each case will need its own treatment. Hard rubber tubes for *long wear* and built up tubes with extra large heads and large retaining swell are called for. Accessible granulations may be removed, and superficial granulations may be attacked by coating the tubes with gelatin and alum or tannin, as suggested by O'Dwyer. In some cases, but rarely, tracheotomy must be done, with subsequent local treatment and dilatation. Specially built up tubes are also used when swollen tissue overrides the head of the ordinary tubes in primary intubation. As a dernier resort resection of the constricted portion of the larynx or trachea has been performed.

Secondary stenosis, after intubation, due to abductor paralysis, has been reported, but lacks confirmation. Secondary stenosis or persistent hoarseness with moderate stenosis may be due to ankylosis of the crico-arytænoid articulation, which may follow any local inflammatory process. Vibratory massage would be applicable to such conditions. Antitoxine and intubation combined have given such brilliant results in croup that primary tracheotomy is now rarely performed in this country for diphtheritic stenosis. A rapid tracheotomy may become necessary if, in the act of tubing, the stenosis should suddenly become complete. This accident has happened to the writer in tubing an adult for stenosis of several weeks' standing and of unknown origin. The tube struck a subglottic vascular new growth, which bled freely into the bronchi. A rapid tracheotomy was performed and the hæmorrhage fortunately arrested, the patient making a complete recovery. Intubation in the adult is a difficult and rather unsatisfactory procedure. In diphtheria cases with great swelling of the tonsils, of the uvula, and at the entrance to the larynx, tracheotomy would probably be the most satisfactory operation.

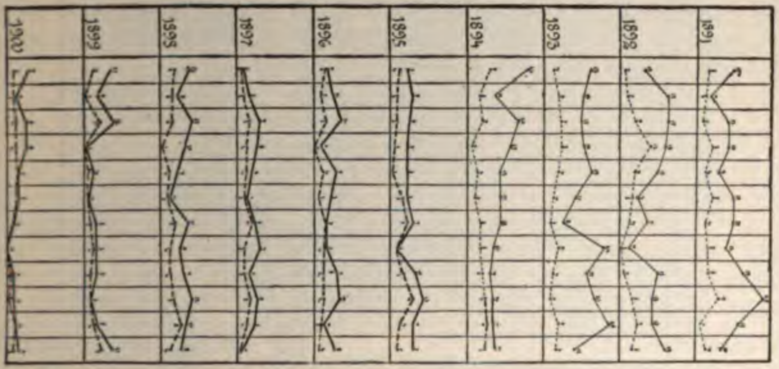

FIG. 77.—INTUBATION STATISTICS OF BUDAPEST STEPHANIE CHILDREN'S HOSPITAL.

Serum period represented by thick line ——. Mortality represented by the interspace between two lines. (Prof. Bokay.)

Tracheotomy is not a difficult operation, but is, as a rule, an unpleasant one in private practice. In performing the operation the surgeon is usually fortunate if one trustworthy assistant is at hand, who is expected to administer the anæsthetic and assist at the wound as well. Now, if the patient is in any way troublesome, as is frequently the case, the operator may not be able to proceed with the necessary ease and facility. In such a case the author's *automatic retractor* will be of service; it will keep the edges of the wound well apart, it may be hooked into the fascia as the several layers are divided, it will hold aside such blood vessels as are in the way of the knife, and may finally be hooked into the edges of the tracheal wound, the trachea may be examined at leisure, and there need be no haste in getting the tube into its place.

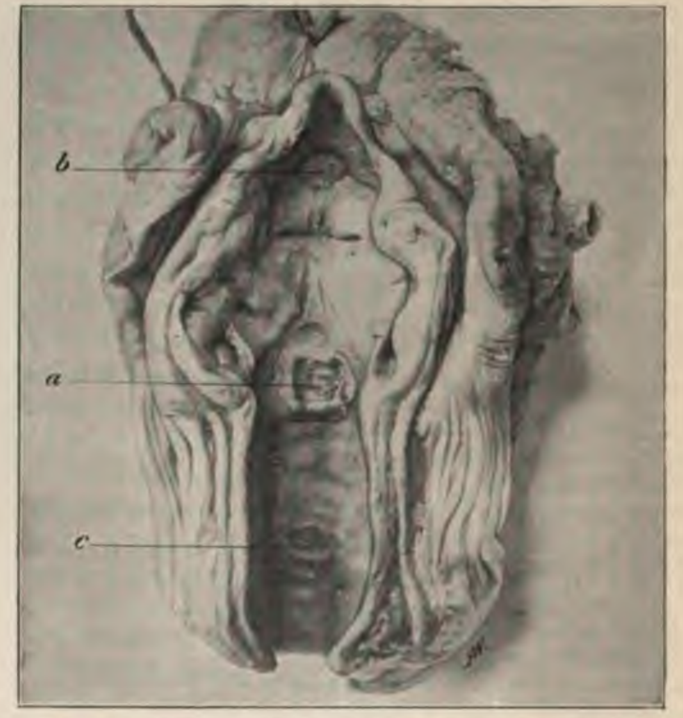

FIG. 78.—LARYNX OF CHILD TWO AND A HALF YEARS OLD.

Showing ulceration caused by too large a tube. The ulceration at *a* involves the whole thickness of the cartilage. Those at *b* and *c* are mere abrasions. (Dr. M. Nicoll, Jr.)

The instrument, devised many years ago, consists of a rubber band to each end of which is attached a curved double hook of nickel plated steel. It can be used as a general retractor in operations requiring careful dissection in different parts of the body; but it is especially applicable to the neck.

The instrument can be disinfected and the rubber must be renewed occasionally.

With a bottle, wrapped up in toweling to act as an appropriate support at the nape of the neck, and the child under chloroform, an incision is made about two inches long, from the superior border of the thyreoid cartilage downward. The best guide is the cricoid ring, which is the most prominent part to be felt in children. After the skin has been incised, the superficial fascia is divided on a director, and the presenting veins are held aside by means of the author's retractor. To get at the three upper tracheal rings above the thyreoid isthmus, we make a transverse incision into the deep fascia where it is inserted into the cricoid cartilage (Boze's point). This done, the deep fascia, and with it the isthmus of the thyreoid gland, can be pushed downward with any blunt instrument, and enough space gained to open the trachea. The trachea can also readily be reached below the isthmus of the gland by means of blunt preparation and by the aid of the automatic retractor, little else but fat and dilated veins presenting themselves in this region. In opening the trachea we cut from below upward, and do not plunge the knife into the trachea with any force, so as to avoid injury to the posterior tracheal wall. After the membranes and secretions have been expelled by coughing, the tube is introduced and secured by a tape around the neck. The tube is removed at least once a day and cleansed, and should not be discarded until the patient is able to breathe for days with the inner tube out and the outer tube closed with a cork.

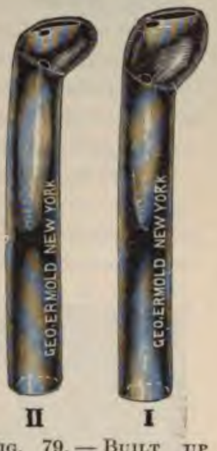

FIG. 79. — BUILT UP HEAT FOR GRANULATIONS.

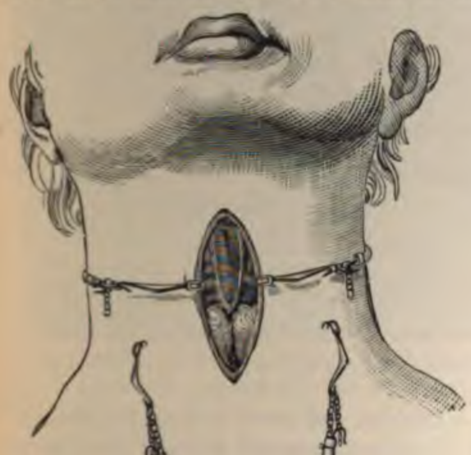

FIG. 80.—AUTHOR'S AUTOMATIC TRACHEAL RETRACTOR.

To cleanse the tracheotomy wound with the tube *in situ*, the writer attaches a rubber tube six inches long to the tracheotomy tube, and uses a strong spray of any desirable antiseptic solution; the attached rubber tube prevents the spray fluid from entering the trachea, and permits breathing at the same time. When there is much difficulty in expectorating the secretions, a few drops of salt water occasionally dropped into the trachea through the tube will facilitate their expulsion. Feeding and medication present no difficulties. Secondary granulations are excised or cauterized, and intubation may be done to discard a tracheotomy tube in difficult "décanulement."

Disinfection of the Sick Room. See also article on Disinfection

The general principles involved in the prevention of infectious disease are not complex:

1. Isolation of the patient, and avoidance of the sick room.
2. Disinfection of rooms and their contents by steam or chemicals or by cleanliness and sunshine; personal disinfection and prophylaxis, including fortifying the system.
3. Ventilation to prevent concentration of poisonous matter.

The management of diphtheria and scarlet fever in a private house according to these principles is not difficult. The patient is isolated in a clean room, bare of all but the necessary furniture. A hall bedroom or one on the top floor is to be preferred. In some instances it may be advisable to keep the patient in the ordinary bedroom occupied at the time of being taken sick, and quarantine, in the best manner possible, this floor of the house already infected. The well children are to be kept from school and church. Where the intercourse of parents with a sick child cannot be avoided, even when trained nurses are employed, it may become necessary to isolate the well children. Food and drink not consumed by the patient must be burned or disinfected in a slop jar holding a chlorinated soda solution. Dishes should be rinsed in soda solution, 5 per cent, and a sublimated solution 1 to 1,000, before returning them to the kitchen. As dried sputa are liable to be spread through the air, all expectorated matter should be received into rags or paper spittoons, which are to be burned,

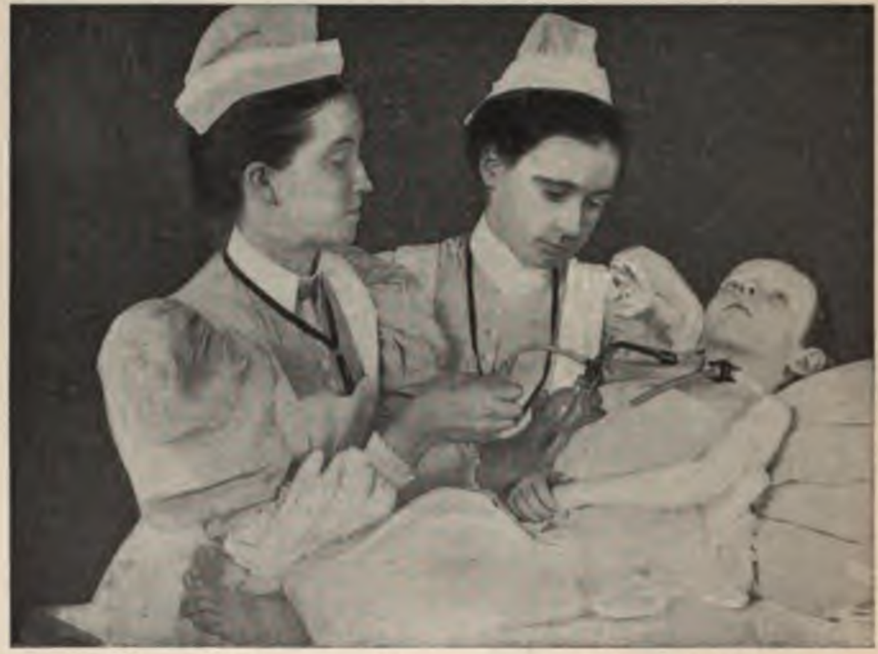

FIG. 81.—CLEANSING TRACHEOTOMY WOUND WITH TUBE IN SITU. (Author's method.)

or into a jar holding a sublimate solution, 1 to 1,000. The sick room should not be swept with a broom, to avoid raising dust. For cleaning purposes, employ moist rags, which are to be burned. Urinals, bed pans, and fæces are treated with quicklime, bichloride solution, 1 to 1,000, or Labarraque's solution.

The nurse should not eat or drink in the same room with the patient, and before going to meals she should clean her hands and arms with green soap and sublimate solution, 1 to 1,000, and put on a clean, long, loose gown, which hangs outside of the sick room. During the period of desquamation the patient should receive a daily bath of tepid water containing green soap. At the termination of a case the nurse takes a bichloride bath, 1 to 2,000, and washes her hair with the same solution. In case of death, the body is to be wrapped up at once in a bed sheet soaked in mercuric bichloride solution, 1 to 1,000, and no public funeral is to be permitted. The sick room and all objects in it must be disinfected. Hard finish or painted walls and ceilings and floors may be washed or sprayed with disinfecting fluids. Papered walls may be rubbed down with a damp cloth or bread crumbs; or, better still, the paper should be removed. A fresh coat of kalsomine or whitewash is advisable wherever it can be applied. After disinfection, the windows must be kept open day and night for several days. Carpets, upholstered furniture, and other articles can be disinfected by steam through the health board or at private disinfecting plants.

Recently formalin vapor has been extensively used for disinfecting sick rooms and their contents, and, as far as my experience goes, I consider it to be a powerful disinfectant, far superior to sulphur. Formalin vapor is generated in an apparatus which permits the gas to be discharged by means of a tube through the keyhole into a room which is otherwise tightly closed.

TONSILLITIS, PERITONSILLITIS; QUINSY

The ordinary clinical variations of acute tonsillar inflammation are:

1. *Follicular tonsillitis* (non-diphtheritic).
2. *Croupous tonsillitis* } pseudodiphtheria.
3. *Ulcero-membranous tonsillitis* } pseudodiphtheria.
4. *Diphtheritic tonsillitis.*

No amount of experience will enable us to distinguish clinically between 1, 2, 3, and 4 in any locality in which diphtheria is endemic. What looks like tonsillitis to-day may be diphtheria to-morrow. Such cases must be isolated and treated like diphtheria; if a subsequent examination proves the contrary, no harm has been done. The so called pseudodiphtheria kills children as well as the Klebs-Loeffler variety. In this field the value of bacteriological examinations as practised in large cities has been overestimated. In country districts in which diphtheria is not endemic and in immunized children in the city we see cases of undoubted acute follicular tonsillitis, but there are no *reliable* differential points. At the bedside in acute sore throat cases, clinical observation goes before laboratory statistics, and a report "No diphtheria bacilli found" should influence the practitioner but very little, if at all, in the subsequent management of a case.

Differential Points.—*Syphilis, leptothrix,* and other rare parasitic affections of the tonsils; are not liable to be confounded with diphtheria, pseudodiphtheria, or tonsillitis. Membranous and ulcerative lesions of the mouth and throat may be due to the spirillum of Vincent (diphtheroid angina). Such deposits gradually disappear after mild local antiseptic treatment.

Symptoms.—The *symptoms* of tonsillitis are fever, general malaise, vomiting, pain on swallowing, and noisy respiration. The tonsil is red and swollen; the lymph nodes are swollen; the tongue is coated. In follicular tonsillitis a punctate, cheesy deposit protrudes from the crypts of the tonsil.

Treatment.—A child afflicted with so called tonsillitis should be isolated and should receive a warm bath and a laxative or an enema, and should be put to bed. A cool compress may be placed around the neck, and over this a flannel bandage. The compress may be renewed every hour or two, or an ice poultice may be put around the throat (ice and sawdust wrapped in oiled silk).

The child should receive cooling drinks and a liquid diet. (See Fever Diet.) Salt water should be dropped into each nostril every two to three hours. (See Nasopharyngeal Toilet.)

Internally the following prescription may be administered:

℞ Tinct. iodini, ... gtt. x;
Aquæ menth. pip., ... ℥jss.;
Syr. simplicis, ... ℥ss.
M. Sig.: A teaspoonful every hour.

Older children may have cracked ice to swallow, and gargle with chlorate of potassium solution (2 per cent). The prognosis is favorable.

It must be emphasized, however, that in all centres of population in which diphtheria is endemic even a simple tonsillitis must be looked upon with suspicion, and at the first sign of a cheesy or membranous deposit, be it punctate or not, a curative dose of diphtheria antitoxine (2,000 to 4,000 units) should be administered to children in order to be on the safe side as regards further development.

Phlegmonous Tonsillitis, or Quinsy.—The jaws become stiff, and the mouth is opened with difficulty. Swallowing is very difficult; food regurgitates through the nose; the voice has a nasal character; fever and constitutional disturbances are marked; and there may be hoarseness or noisy respiration.

TREATMENT.—Is the same as in the mild variety. Children should receive 2,000 units of antitoxine. If cold applications are not tolerated, a hot poultice or hot water bag may be applied. Early incision of a pointing abscess or fluctuating soft area, with or without local anæsthesia, is of the utmost importance on account of the danger of œdema of the glottis and death from suffocation. Surgical interference from without through the skin is often necessary under general anæsthesia, in order to relieve tension when deep tissues are involved. In the severe and dangerous form known as *angina Ludovici* the tissues of the neck present tense induration, and a fatal termination is the rule unless good and timely surgical interference is at hand.

HYPERTROPHIC TONSILS IN CHILDREN

Enlarged tonsils obstruct the posterior nares and are a prolific source of nasal and aural disease. They are frequently found associated with adenoid vegetations in the vault of the pharynx.

Symptoms.—*Nasal voice, reflex cough, noisy respiration, peculiar facial expression, mouth breathing, snoring at night, deafness,* and *restlessness* in sleep.

Enlarged tonsils are usually the product of repeated attacks of tonsillitis, and have in themselves a tendency to acute inflammation. Inflamed tonsils are a source of danger to the individual, as they appear to favor systemic septic infection, with subsequent localization in vital organs (endocarditis and myocarditis). As a portal of entrance for infection, however, the inflamed or enlarged tonsil is of minor importance as compared with the retropharynx in a state of inflammation or irritation.

Treatment.—The reduction of enlarged tonsils in children is best accomplished by means of the tonsillotome, at one sitting. The use of the tonsil knife and cutting forceps for the purpose of slitting up the crypts and removing tissue piecemeal is more adapted for work upon adults. The Tiemann-Fahnenstock or MacKenzie tonsillotome, is perhaps the handiest instrument to use in connection with the intubation gag. The *tonsillotome* will remove a tonsil which can be engaged in its ring. Tonsils which are fixed by adhesion to the anterior pillar of the soft palate cannot as a rule be engaged by the tonsillotome blade until the adhesions have been loosened so that the tonsil may protrude. Elongated hypertrophic tonsils extending low down in the pharynx also present difficulties in the way of removal. The tonsillotome may have to be applied twice to the same side. In many instances the removal of the upper, greater portion of the tonsil will relieve the symptoms on account of which the operation was done. Soft, friable tonsils are apt to be crushed by a blunt ring knife and may require subsequent trimming with curved blunt pointed scissors. Anæsthesia in tonsillotomy is not absolutely necessary. If the parents of children request an operation under anæsthesia, ether is perhaps the safest anæsthetic, all things considered, and the narcosis need not be deep. The tonsillotome should be sterilized by boiling in a weak soda solution, and if there is time the nasopharyngeal toilet should be employed for a few days prior to the operation. If one is compelled to operate during an epidemic of diphtheria, a prophylactic dose of antitoxine is in order.

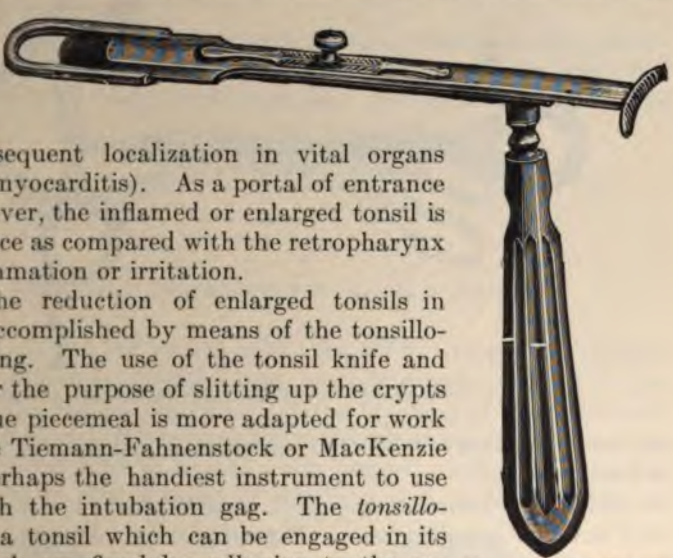

FIG. 82.—MCKENZIE TONSILLOTOME.

After-treatment and Sequelæ.—After the tonsils are out, the parent is told that the child may vomit dark blood which it has swallowed, and that a fresh hæmorrhage should be reported at once. The patient must have only soft or liquid food for a few days, and the nasopharyngeal toilet should be practised. Older children will gargle in addition.

The formation of a *pseudomembrane* on the wound made by the tonsillotome is frequently observed, with and without constitutional symptoms (fever). This may be due to an unclean instrument, an unclean throat, or both.

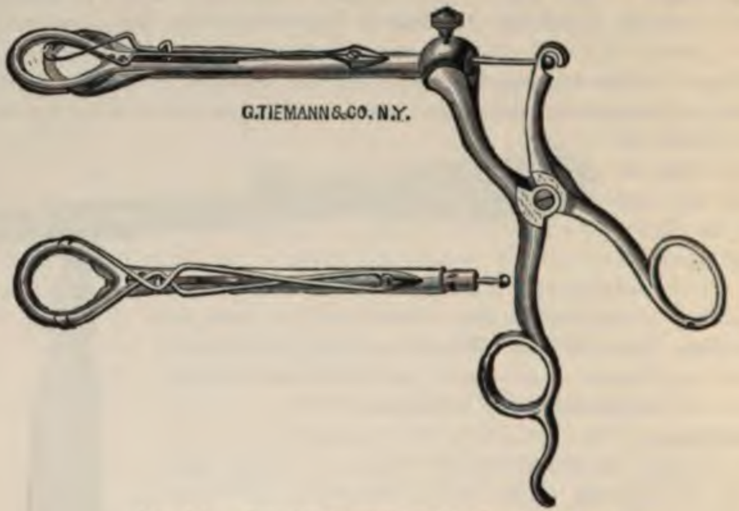

Fig. 83.—Tiemann-Fahnenstock Tonsillotome.

Dangerous hæmorrhage after tonsillotomy is rare in children unless they have the so called hæmorrhagic diathesis. Bleeding may be controlled by ice or alum solution (both should be at hand), and digital pressure with the thumb can be kept up for hours if necessary. If bleeding cannot be controlled by such means or by the actual cautery, the external carotid will have to be ligated.

It is best, all things considered, not to remove the tonsil completely, but to leave a small stump which could be grasped by a forceps for the purpose of controlling severe hæmorrhage. The teaching that a tonsillotomy is a failure unless the tonsil is completely removed is not in harmony with the experience of the writer. Tonsils and adenoids can be removed at one sitting under ether anæsthesia.

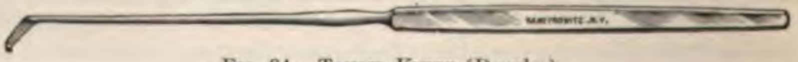

Fig. 84.—Tonsil Knife (Douglas).

ADENOID GROWTHS AND THEIR REMOVAL

Adenoid vegetations are common in children and give rise to excessive discharge of mucopus, with reflex cough. The character of the voice is altered, and mouth breathing is the rule. The presence of adenoids often causes ear symptoms (pain and chronic otitis), and bed wetting is frequently observed in children with nasal obstruction. A positive diagnosis is readily made by a digital exploration with the index finger, nail side up. The growths are of a soft, pulpy consistence—in some cases the growths are firm and feel like a bunch of worms.

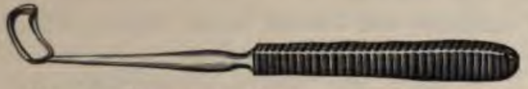

FIG. 85.—BECKMANN'S CURETTE FOR ADENOIDS.

Local medication will not effect a radical cure, which can only be accomplished by extirpation of the growths. The operation can be performed without an anæsthetic or under ether narcosis. The patient is firmly held in an upright position and the mouth held open by mouth gag (intubation gag). A properly curved fenestrated post nasal forceps is inserted behind the soft palate into the vault of the pharynx; the branches of the instrument are opened and then closed, whereupon the instrument is removed, carrying with it as much of the growth as has been caught within its branches. A Beckmann curette is now inserted in the same way, and by dexterous manipulation the remaining adenoids are planed off. The removal of a portion of the growth with forceps is mainly for the purpose of demonstrating to the parents of children the nature of the trouble. The brisk

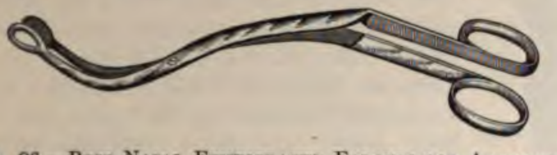

FIG. 86.—POST NASAL FENESTRATED FORCEPS FOR ADENOIDS.

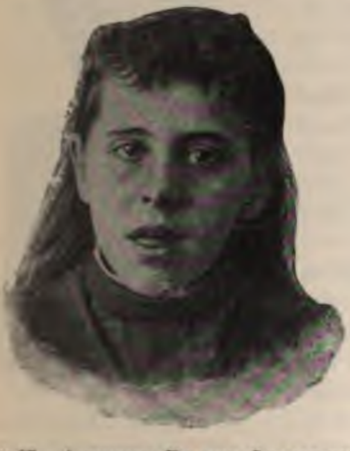

FIG. 87.—ADENOIDS BEFORE OPERATION. (Dr. French.)

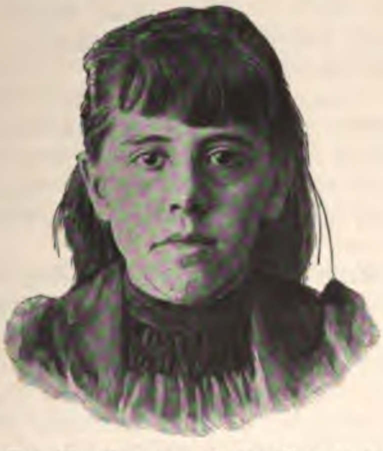

FIG. 88.—ADENOIDS AFTER OPERATION. (Dr. French.)

hæmorrhage following the operation usually stops promptly, or alum water may be dropped into the nostrils as a styptic. If performed under an anæsthetic, the position of the head must be such as to avoid asphyxia from flow of blood into the trachea.

Removal of Adenoids and Tonsils under Ether.—Chloroform as an anæsthetic appears extra hazardous to those having a lymphoid tendency. After the child is anæsthetized (the head being dependent over the edge of the table and supported by the assistant), the jaws are held open with a mouth gag, the forceps is introduced, and all tissue within its grasp is removed. Then the curette is used, and the finger may sweep all over the postnasal space to detach loose tissue with the nail. The patient is turned over on his face and the blood allowed to flow out, the nose and throat are well sprayed with an iced antiseptic solution, and the operation is finished. The patient is now placed in bed, the directions are given for a soft diet, and a spray of the iced antiseptic solution in the nose and throat is used once every two hours. On the following day the patient may be up and about. In operating for phimosis, adenoids and enlarged tonsils if present can be removed before the patient is out of his narcosis, and vice versa.

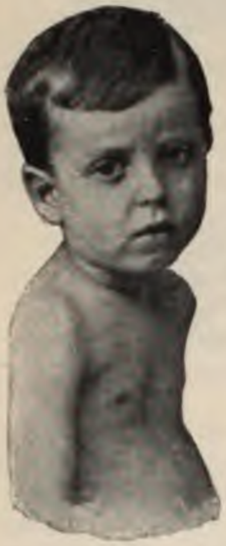

FIG. 89. — ADENOIDS BEFORE OPERATION.

In *severe hæmorrhage* following the operation a tampon saturated with alum water may be firmly wedged into the nasopharynx, as in nasal hæmorrhage.

POSSIBLE AND AVOIDABLE TRAUMATISM DURING OPERATIONS FOR ADENOIDS.—*Traumatism* of the soft palate; injury to the posterior border of *the septum;* injury to the pharyngeal wall in extreme curvature of the *cervical vertebræ.*

Morbid Conditions Simulating Adenoids to Account for the Persistence of Symptoms after the Removal of Adenoids and Large Tonsils.—Many children with symptoms pointing to the existence of adenoids are found upon examination to be suffering from some other affection. The conditions which have been found to simulate adenoids comprise the following:

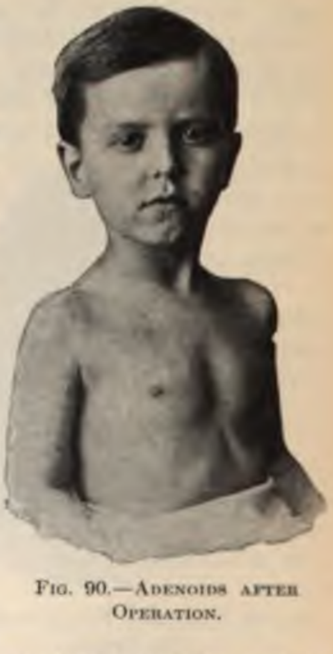

FIG. 90.—ADENOIDS AFTER OPERATION.

1. *Diminutive choanæ and nostrils.* These occur frequently and in association with a low vault of the pharynx and other anomalies of development in subnormal children. These defects appear to be of rhachitic origin in some cases.

2. *Paresis* of the *soft palate* and *pharynx*. This affection is symptomatic of a number of conditions.
3. *Septal anomalies*. The septum may be prolonged backward into the nasopharynx, dividing the latter into two compartments.
4. *Forward projection* of the *vertebral column*, usually due to deformity of the arch of the atlas.
5. *Retropharyngeal abscess* and the *enlarged lymph ganglia* from which the former originates.
6. *Undue prominence* of the *soft parts* over the *internal pterygoid plate*.
7. Ordinary *neoplasms* of the nasopharynx.

RETROPHARYNGEAL LYMPHADENITIS AND ABSCESS

The vast majority of cases in children arise from suppuration of the lymph nodes, and not from caries of the spine. Infection of pharyngeal lymph nodes takes place from the mucous lining of the nasopharynx. It may be tuberculous, but generally it is simply inflammatory. The writer has known it to develop in children whose pharynx had been repeatedly examined with the fingers by medical students.

Symptoms and Diagnosis.—Young children, when brought to the physician suffering from an incipient retropharyngeal abscess, are restless and refuse food. They have a nasal cry, "*voix de canard*," and at first no definite localization of the *fever* or its cause is possible. Gradually the throat symptoms increase; the breathing becomes noisy and dyspnœa is urgent, particularly in cases in which the abscess is low down, and swallowing is difficult and painful and accompanied by regurgitation. The head is held in a characteristic position and turned to one side. On examining the throat by reflected light or sunlight, we find it in a swollen condition, and in the majority of cases we notice a bulging of the posterior pharyngeal wall. Careful digital examination will tell us more definitely the extent and location of the soft fluctuating tumefaction. In rare instances a sudden attack of dyspnœa is the first symptom noticed.

Differential Diagnosis.—A diphtheritic pseudomembrane is absent and there are no hoarseness and aphonia, as in croup. Adenoids and enlarged tonsils will give almost identical symptoms and may also be present as a complicating feature. *The educated finger will recognize the actual condition with which we have to deal.*

Treatment.—A localized accessible abscess may be opened by direct incision through the mouth. A thin walled abscess may be punctured by means of a blunt dressing forceps, and the branches of the forceps may be spread to encourage free exit of the pus. The child's head must be lowered to prevent flooding of the larynx. A retropharyngeal abscess opened by a simple small incision is apt to close and fill again, but an opening made by a blunt instrument does not heal up. In operating from the mouth narcosis is usually not feasible.

In the presence of marked dyspnœa and a deep seated abscess low down and difficult to reach, and in those cases in which the pus has spread downward toward the lateral surface of the neck, a direct incision from outside behind or in front of the sternocleidomastoid muscle and under antiseptic precautions is indicated. In weak babies under one year opening the abscess through the mouth is to be preferred, on account of the danger associated with general anæsthesia. Tracheotomy is rarely called for, as it usually takes a week before suffocation becomes imminent. Intubation is not applicable in such cases, as the swelling would override the end of the tube.

Prognosis.—In cases of retropharyngeal abscess in children the prognosis depends upon the age of the patient and the time and manner of treatment. Death may occur slowly from asphyxia or suddenly, in advanced cases, from suffocation, due to rupture of the pus sack. Pus may burrow in various directions or discharge through the ear. A timely incision will save almost all the patients.

Nasal intubation by means of soft rubber tubes is sometimes applicable in cases of dyspnœa due to acute nasopharyngeal swelling in infants.

ERUPTIVE AND OTHER FEVERS

MEASLES ; MORBILLI

Introductory Remarks.—An acute infectious and highly contagious disease, the specific microorganism of which has not been isolated, characterized by a prodromal stage with coryza, fever, cough, "dull eyes" or pink eyes, followed by a brownish red macular and papular eruption. The period of incubation is not definitely known, but is supposed to be from seven to eleven days. If sixteen days elapse after exposure without the disease developing, the person may be considered safe from an attack.

The exanthem appears about the fourth day, first on the face, which has a mottled and swollen appearance, and spreads over the trunk and entire body. It is also visible on the mucous surfaces of the mouth and throat. The skin eruption lasts until the sixth or seventh day, and then gradually fades. A desquamation occasionally sets in in the form of very minute scales.

Peculiarities of the Preeruptive Stage in Measles.—As a forerunner of the rash, small red spots, "Koplik spots," with a minute blue white centre, have been described by Flindt, Reubold, Flatow, Hilton, Fagge, Koplik, and others as occurring on the inner surface of the cheeks in many, but in not all cases. Dr. M. Flindt, in the records of the Danish *Sundheds Collegium*, 1880, describes these spots as follows: "*Second day of fever:* A spotted erythema may be seen on the mucous membrane of the cheeks and lips. This shows quite a remarkable appearance, due to the numerous minute bluish white, shining, and apparently vesicular points which lie in the centre of small red spots and are arranged in irregular groups. One can feel as well as see the small vesicles projecting above their surroundings. *Third day of fever:* Similarly grouped spots with vesicles are visible on the buccal mucous membrane, especially on the part of it lying opposite to the space between the upper and lower back teeth. At this stage the skin eruption first makes its appearance." Dr. Koplik, of New York, describes these spots in the *Medical Record* of 1898 (No. 1431), and distinctly points out that they are often present from twelve hours to five days *before* the cutaneous eruption, and that their presence may enable us to isolate our cases earlier than formerly and aid us in distinguishing measles from other skin eruptions.

Another peculiarity of measles infection, according to the experience of the writer, is that *the temperature curve in the preeruption stage may show a remission to normal or subnormal at irregular periods on the febrile days preceding the eruption, as shown in the chart.* The knowledge of these points is important as regards the early recognition of the disease and the isolation of the patient. (*Trans. of the Amer. Pæd. Soc.*, June, 1898.)

Prognosis.—Uncomplicated cases end in recovery. In the form known as hæmorrhagic, or black, measles death often results from an overwhelming toxæmia. In adults measles is usually of a severe type; in infants and delicate children it is often fatal.

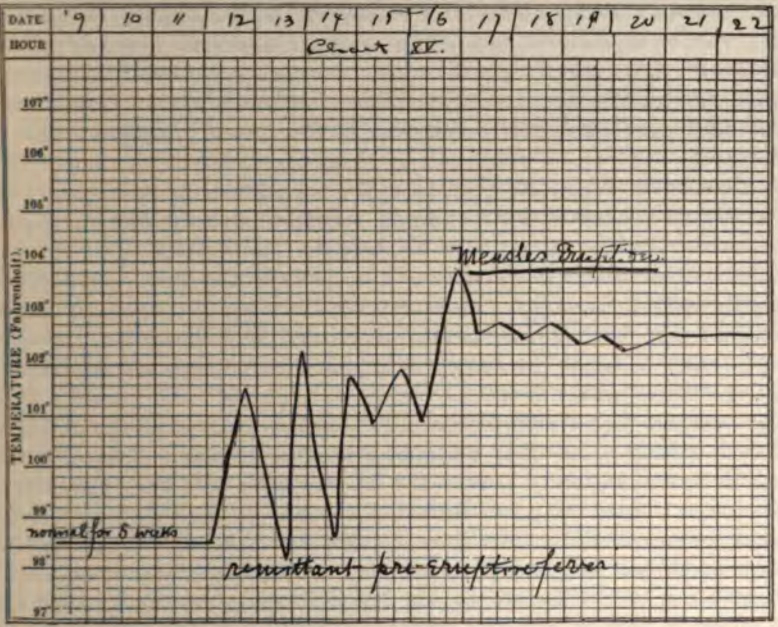

Fig. 91.—Temperature Curve in Measles.

Differential Diagnosis.—In rubella the rash appears earlier, it is evenly distributed and not blotchy, and all the symptoms are mild. Scarlet fever has a sudden onset and no preeruptive remission. The throat is sore and the rash is scarlet; the eyes are bright.

Prevention.—One attack usually confers immunity. It is so highly contagious that it is extremely difficult to keep it out of children's hospitals and wards. Plastic operations should not be attempted on children who have *not had measles and who have recently been exposed*, on account of serious interference with the healing process in the event of their being attacked with measles.

Treatment.—We have no specific medication for measles. The patient is given a warm bath and an enema or laxative, and kept in bed, isolated, for a week. The room should be well ventilated and not heated above 68° F. The patient should have a fever diet and cooling drinks. Very high fever is managed by hydrotherapeutics (see General Therapeutics). The nasopharynx is to be kept moist and clean by dropping salt water from a spoon or pipette into each nostril four times a day. This will also ameliorate the throat cough. A warm bath may be given daily, and the eyes may be frequently washed with boric acid solution. In extreme restlessness a single dose of antipyrine or phenacetine may be given at night. When the cough is very annoying, from 5 to 10 drops of paregoric may be given occasionally.

Complications and Clinical Varieties.—Incessant hacking cough; croupy cough; aphonia and stenosis of the larynx; active angina; follicular tonsillitis; visible diphtheria and croup; nasal diphtheria early or late (often overlooked); late membranous croup; pertussis; bronchopneumonia and lobar pneumonia or tuberculosis of the lung; severe conjunctivitis; stomatitis and gastroenteritis; gangrene in the mouth; gangrene elsewhere; otitis media.

If there is the slightest indication of a membrane in the throat or nose, or progressive hoarseness with stenosis, full and repeated doses of diphtheria antitoxine should be given (see Diphtheria and Croup). When a nasal discharge persists after the measly eruption has disappeared, and particularly if the discharge is bloody or offensive, a culture should be made and search undertaken for the Klebs-Loeffler bacillus. If hoarseness and aphonia develop, with a nasal discharge, after measles, antitoxine is indicated at once, even if the throat is clean.

The various other complications of measles are discussed under the various headings. In rare instances hoarseness and a mild degree of stridulous breathing may persist for a long time following measles. This complication, which may be termed a chronic laryngitis, is not improved or cured by medication. In such a case the child should be sent to the country or to the seashore, away from a dust laden atmosphere. The administration of potassium iodide by the mouth or rectum, gr. 11 to 5 three times a day, is rational whenever syphilis is suspected as an underlying cause of such hoarseness.

RUBELLA; RÖTHELN; GERMAN MEASLES

This infection is seen in two types, one resembling mild measles and the other resembling mild scarlatina. The *rash* comes out in pinkish spots (maculo-papules) on the first or second day. It appears first on the face and spreads over the whole body. It persists from three to five days, and may be followed by a slightly perceptible desquamation. The temperature is seldom more than 100° or 102°. In the absence of a bacteriological test it cannot, except in theory, be distinguished from mild measles. It is contagious, and there is swelling of the posterior cervical glands. It occurs in epidemics, it is distinct from measles and scarlet fever, and it may be confounded with measles, scarlatina, influenza, and erythema multiforme. Complications and sequelæ are seldom observed.

The **treatment** is by isolation and rest in bed for a week, liquid diet, fresh air, and attention to the bowels.

VARICELLA (CHICKENPOX)

A papular eruption ushered in with slight fever and malaise and occasionally a temperature of 103°. The eruption becomes vesicular in a short time, and the vesicles are frequently surrounded by a narrow area, or circle, of hyperæmia. The vesicles may hold a clear or cloudy fluid and *may become umbilicated.* In drying up they form a crust which drops off without, as a rule, leaving a scar. The vesicles may appear in successive groups. The contagium of the disease has not as yet been isolated, and it is at times very difficult to discriminate between varicella and varioloid. Chickenpox is not rare in adults.

The **symptoms** are those of a mild infection, with general malaise and slight fever before the eruption. In discriminating between varioloid and varicella we should be guided by the following points: In varicella the eruption usually appears first upon the trunk, rarely on the forehead or face. The vesicles vary in size, break readily, and are superficial with a very slightly marked red areola. They develop in successive crops. All stages can be seen side by side. There is usually a history of exposure to varicella. The constitutional symptoms are mild. In variola there is a more sharply defined hyperæmic area surrounding the variola vesicle. In the early stage of its eruption the forming vesicle feels like "shot" underneath the skin. In *smallpox* the hands and feet usually show hard and circumscribed papules. Varicella and scarlet fever may occur together. In rare instances the skin becomes infected through a broken vesicle, or pock, and erysipelas or gangrene of a patch of tissue may result. Uncomplicated cases of chickenpox get well.

Treatment.—Direct quarantine in a well ventilated, sunny room, order soft diet, and open the bowels. The eruption in the mouth requires a mouth wash of chlorate of potassium (2 per cent solution). For varicella of the vulva we apply cold cream.

SCARLET FEVER

Introductory Remarks.—Scarlet fever is an infectious disease the specific poison of which, highly contagious and capable of reproducing itself, has not as yet been isolated. It probably enters the system through the nasopharynx and respiratory tract, and may be conveyed in all the ways in which contagious disease is distributed. The main factor in the causation of epidemics is personal intercourse. It is believed, but not proved, that domestic animals may contract scarlet fever transmissible to man. Milk epidemics and drinking water epidemics, as reported in literature, lack bacteriological proof. The common mode of infection is by direct or intermediate contact with a scarlatinous patient, and by contact with the secretions, excretions, and exhalations of the body, and by means of books, toys, etc., soiled by patients having scarlet fever. The period at which scarlet fever is most contagious and the duration of capacity for infection are not definitely known. The susceptibility and immunity of individuals and families, and the period of incubation, are inconstant; the latter varies from a few hours to a few weeks. No age, sex, or race is exempt. Few cases, however, occur in adults. Ill ventilated and filthy localities are favorable for the propagation of scarlet fever. Most cases occur during the cold season of the year, when the closing of windows prevents proper renewal of air in the houses.

The severest forms are observed in children of a lymphatic diathesis whose nasopharynx is not normal (croupy children). On the other hand, scarlet fever complicated with diphtheria may run a comparatively safe course in children afflicted with adenoids and enlarged tonsils and generally of anæmic appearance. This would naturally lead to the inference that the contagion had various degrees of virulence, and that the blood offered more resistance to the infection in one case than in another. Regarding this important question we are still in the dark.

The mortality may be as low as 5 per cent in some epidemics, and as high as from 30 to 40 per cent in others. According to the reports of the New York State Board of Health, scarlet fever is most prevalent in the first four months of the year.

Infection ceases with the termination of desquamation and convalescence. The failure to establish the origin of sporadic cases is due to defective methods of investigation in the absence of positive knowledge as to the exact nature of the poison.

Scarlet fever is very prevalent and has a large mortality and many and dangerous sequelæ; thus the wisdom and *necessity of preventive measures* are self-evident. The poison of scarlet fever may be *diluted* and *rendered innocuous* by persistent *ventilation* and *disinfection;* this, together with *isolation* of the patient, *limits the spread of infectious disease* in a household, institution, or community. The fact that some contagious diseases are infective during the preeruptive stage is no argument against the necessity of taking active preventive measures for the three or four weeks following, during which time infection still continues. At least three weeks should elapse from the date of exposure before freedom from danger of an attack is secured.

THE PERIOD OF INCUBATION is supposed to vary from one to seven days. A child exposed to scarlet fever contagium and remaining free for two weeks may be considered out of danger. The utmost care should be exercised to keep scarlet fever out of lying-in and operating rooms.

Mother and infant may have scarlet fever after childbirth, and in many instances the results of plastic operations are marred by flaps sloughing from scarlatinal disease following operation.

After the discovery and isolation of the specific poison of scarlet fever, which is not unlikely to take place in the near future, we may also hope to obtain specific means to immunize and cure. Under all circumstances it is the duty of the general practitioner to inform himself as regards the best methods of prevention and disinfection, and to urge their adoption in every case coming under his notice and care. These methods of prevention are applicable to all infectious diseases and are discussed in a special chapter on Infective Fevers.

Onset and Symptoms.—The disease begins abruptly as a rule with vomiting and thirst, rarely with a chill; young children may have convulsions. The fever rises to 104° or 105°, the pulse is rapid (120–150), the respiration is increased in frequency, and the child complains of sore throat. The scarlet rash appears on the second day, on the neck and chest first, and may spread over the entire body within the next twenty-four hours. The rash is punctate or finely papular, diffuse or in patches, and slowly disappears after persisting from two to five days. The throat looks red and swollen, and the tonsils may be covered with a punctate exudate. Pseudomembranes and diphtheritic patches are often seen on the tonsils and pharynx. From the gross appearance of these patches one is unable to say whether they are Klebs-Loeffler or streptococci patches. As a rule they are of a mixed nature. Minute macules of a dark red color are generally seen on the hard or soft palate. The lymphatic glands of the neck are swollen. The tongue is at first covered with a fur, and after a few days exfoliates and becomes red ("strawberry tongue"). Headache, general restlessness, insomnia, and delirium are present in severe cases. The urine is scanty and may contain albumin and hyaline casts. In favorable cases the temperature becomes normal on the seventh or eighth day, and desquamation sets in, lasting three weeks on an average and occasionally from six to eight weeks.

Differential Diagnosis.—In the absence of a bacteriological test, it may be difficult and often impossible (except by those who can see the grass grow) to distinguish a scarlet fever rash from a scarlatiniform rash, such as we occasionally observe after the administration of certain drugs: Belladonna, quinine, antipyrine, iodoform, balsam of copaiba, etc., and also in cases of intestinal indigestion. Slight desquamation may even take place in a skin which has been the seat of a scarlatiniform rash, and desquamation following measles is nothing rare.

The measles rash is of a brown red color, and presents itself in large irregular spots. The patient has coryza, cough, sneezing, and dull eyes. In German measles the throat symptoms are absent.

Diphtheria with a scarlatiniform eruption cannot be distinguished clinically from a scarlet fever infection with diphtheritic sore throat; and as regards the drug and indigestion rashes, each case must be judged upon its merits. With a clear throat and normal temperature, it would seem unnecessary to quarantine a patient who happens to have a suspicious rash.

Prognosis is uncertain. The mortality varies from 5 to 30 per cent. We have no means of gauging the power of resistance of the individual as regards sepsis, and, even when the acute stage is safely passed, subsequent complications may endanger and destroy life. Severe throat symptoms, early delirium, uncontrollable vomiting, high temperature, and high pulse are unfavorable symptoms. This is a brief pen picture of a moderately severe case of scarlet fever terminating favorably in due time. Apart from this form, we observe every variety as regards severity, complications, and sequelæ.

The *mild form* may present itself with the rash, a red throat, and a temperature of from 100° to 101°, or the rash without throat symptoms and without fever. In this form the pulse is from 100 to 120.

The *severe form* may present an initial diphtheria which spreads over the nasopharynx, with extensive pseudomembranous inflammation and much glandular swelling, invasion of the middle ear, and evidence of scarlatina on the second day.

Malignant Form.—Initial throat symptoms with a yellowish greenish deposit on the tonsils and throat, a scarlet rash on the second day coming out sparingly, a pultaceous condition of the throat, vomiting incessant, temperature high, pulse 150 to 180, active delirium, and death on the third, fourth, or fifth day.

The *ordinary onset* with diphtheritic complications at the end of the first or second week. Heart, lungs, and kidneys free.

Hæmorrhagic Form.—A black eruption, petechial or in large ecchymoses, with hæmaturia and other evidence of intense sepsis usually fatal from the second to the third day. Some patients recover.

Fatal Septic Form.—Onset sudden and intense, temperature 106° to 107°, delirium, vomiting, convulsions, coma, and death before the rash has had time to develop.

Scarlatina and measles may coexist in the same person. Wounds predispose to the development of scarlatina (surgical scarlet fever).

Treatment.—In very mild cases the children are to be put to bed on fever diet, and they require no other treatment. As soon as a child is known to be ill (with vomiting, fever, and sore throat), it should receive a warm bath, of 100°, and an enema, and be put to bed and isolated in a room the temperature of which is not over 65° to 68°. Should an inspection of the throat reveal a patch of pseudomembrane or a puslike exudate, 2,000 diphtheria antitoxine units should be injected at once and a swab culture taken. If diphtheria bacilli are reported found, the antitoxine injection should be repeated on the following day, and as often thereafter as may be necessary to check a complicating diphtheria. Diphtheria sepsis is not so readily checked by antitoxine in scarlet fever cases as in the uncomplicated variety, but in the experience of the author it does no harm and is the only rational specific treatment which we possess. The antitoxine may be administered daily or every other day, according to the indications, in precisely the same manner as in primary diphtheria without scarlatina.

So long as there is much vomiting, ice to suck and cold and hot drinks are indicated. A fever diet is indicated. A *strict milk* diet is not of special import, but as milk is a perfect food in itself, it may be given to a patient exclusively if he will take it and tolerate it. Water should be given in considerable quantities to assist in elimination. When the vomiting has stopped, a good dose of calomel should be given, followed by a saline, to clear the bowels.

A complicating diphtheria requires the nasopharyngeal toilet in addition to the antitoxine; and a cold compress may be put around the neck. Gargling with antiseptic solutions used in nasal irrigation is indicated for older children.

Stimulation is indicated at any stage of the disease if the pulse is weak.

The treatment of scarlet fever by means of scarlet streptococcus serum is in the experimental stage.

For nervous symptoms use the ice cap, baths, one or two doses of phenacetine, or citrophen, gr. ij to v.

Otitis media with perforation of the drumhead is a frequent complication. Occasionally complete deafness persists for a time, but eventually the hearing is reestablished in most cases. The indications for perforating the drumhead are discussed elsewhere (see Otic Memoranda). A discharging ear is best managed by gentle irrigations with 2 per cent boric acid solution every three hours. To allay pain, a lukewarm boric acid solution holding 2 grains of cocaine to the ounce may be dropped into the ear from a spoon. Inflation of the ear by means of the Politzer bag or catheter should not be practised, on account of the danger of forcing septic material from the nasopharynx into the middle ear.

Croup and *stenosis of the larynx* are managed according to the rules laid down in the chapter on Croup.

Bronchitis may call for the administration of an expectorant, such as the aromatic spirit of ammonia.

Painful and *swollen joints* are no unusual manifestations in scarlet fever and call for the administration of sodium salicylate and frequent cold compresses with the limb in a comfortable position. *Torticollis* following scarlet fever is occasionally observed. Swollen lymph nodes can be felt underneath the muscles of the neck in such cases. Mild massage is the proper treatment. If *vomiting* persists, a drop of tincture of iodine in a teaspoonful of sweetened water or peppermint water may be given every two or three hours.

TREATMENT FOR SEVERE SYMPTOMS, COMPLICATIONS, AND SEQUELÆ.—*Hyperpyrexia* is best treated by warm baths and a single dose of an antipyretic, according to the rule laid down in the article on Pneumonia.

In *severe sepsis* (rapid heart, delirium, high temperature) the patient may be kept in the warm bath for an hour at a time. The bath tub must be covered with a blanket in such a manner that only the head of the patient is exposed, and the bath room must be warm (75° to 80°). Stimulants may be given to the patient when he is in the water. After the vomiting is checked and the tongue remains coated, it is wise to give a few drops of dilute hydrochloric acid in sugar water three times a day, to aid digestion. Regarding the management of *meningitis* as a complication of scarlatina, the reader is referred to the article on Meningitis.

LOCAL TREATMENT OF THE NOSE AND THROAT.—In the mild as well as in the severe anginas the nasopharyngeal toilet is indicated. Swabbing or cauterization is not indicated. In the diphtheritic variety, in which antitoxine is indicated, as already mentioned, it often happens that the swelling in the nasopharynx is so intense that swallowing is difficult, and a foul discharge and odor are noticeable from the nostrils. Such cases should have regular energetic irrigation of the nostrils in accordance with the rule in the article on Nasopharyngeal Diphtheria.

When external *sloughing* is observed, a moist dressing of camphor water or balsam of Peru is probably the best. An extension of the diphtheritic process into the larynx, with stenosis, requires intubation.

Itching of the skin may be allayed by sponging with 1 per cent carbolic acid water, or soda in water, or the free use of starch powder.

Prolonged fever lasting for several weeks which cannot be localized is occasionally observed in otherwise uncomplicated scarlatina. It may be due to infection and swelling of deep seated glands and to other causes, and requires no special medication. Opening the bowels, warm baths, the breathing of good, cool air, and good feeding, with hydrochloric acid to aid digestion, constitute the proper treatment in such cases.

Nephritis and dropsy in the wake of scarlatina are nothing unusual. The urine may contain blood or albumin and all sorts of casts. In this condition children may subsist on milk if they will take it. Warm tub baths and hot air baths in bed, under cover, may be employed, and an occasional dose of calomel or some other laxative is always in order. In urgent cases we may give an infusion of digitalis (ʒss to ℥iij), a teaspoonful every three hours. This increases diuresis by increasing the blood pressure. Or we can give one twelfth of a grain of *pilocarpine* once or twice a day as a diaphoretic and eliminant. In complete suppression of the urine life has been saved by cutting down upon the kidneys and splitting the capsule of the congested and inflamed organ, thereby relieving its tension.

Exfoliating dermatitis is occasionally observed as a complication of scarlatina. The entire skin is eczematous and moist, and a rise of temperature accompanies the inflammation of the cutis. Desquamation then sets in and terminates in uninterrupted convalescence; or a renewed attack of dermatitis ensues, and death may finally result from exhaustion. Here, as in most other complications, the TREATMENT is eliminative. The eczematous skin may be covered with cloths moistened with a weak lead lotion or soaked in Carron oil (sweet oil and lime water), or with ichthyol vaseline (1 per cent). The ordinary non-inflammatory desquamation is managed by a daily bath and vaseline inunctions.

GLANDULAR FEVER

Pfeiffer, in 1889, drew attention to the following clinical symptoms complex occurring in children of all ages: Sudden onset; high fever (104°); pain in the joints; restlessness; vomiting; slight coryza and cough; congested fauces; pain in the neck and on swallowing; constipation; large and painful lymph nodes in the whole circumference of neck, but particularly at the nape of the neck, generally on both sides. In the mild form the fever subsides on the second day and the glands gradually subside. The severe form may last from eight to ten days. Suppuration is rare. Nephritis is an occasional complication.

Glandular fever appears to be an acute infectious lymphadenitis of obscure origin. The portal of entrance is probably the upper respiratory tract.

The **prognosis** is favorable.

The **treatment** is by rest in bed, a laxative daily enema, a daily warm bath, and fever diet. The nasopharyngeal toilet should be used.

In protracted cases a few doses of sodium salicylate or quinine saccharinate may be given.

MALARIA IN CHILDREN

Malarial fever as an infectious disease is fully discussed in the chapter on Infectious Fevers. In older children this disease runs about the same course as in adults. In younger children we observe, first, the *acute form,* in which the onset is occasionally ushered in with chills or convulsions with coma (the cerebral type); second, the *chronic form,* in which the children are anæmic and frequently suffer from stomatitis with swollen lymph nodes and an enlarged spleen; and, third, the *masked, or irregular, type.* When an intermittency of fever is observed, it is usually of the quotidian or tertian type. Chills do not set in so abruptly as in adults, and the spleen is not regularly enlarged.

Clinical Types of Malaria in Children.—1. The *cerebral type,* of acute and subacute onset with high temperature, convulsions, and coma.

2. Malarial infection with *bronchopneumonia.*
3. Malarial infection with *acute enteritis.*
4. Malarial infection with *torticollis.*
5. Malarial infection with *acute* and *chronic nephritis.*
6. Malarial infection with a gradually developing *endocarditis.*
7. *Masked malaria* (*malaise, neuralgia, stomatitis* with enlarged lymph nodes).

The masked types particularly are of daily occurrence in the practice of medicine in malarious districts.

Diagnosis.—The diagnosis is established by means of a blood examination (see Laboratory Diagnosis) and also by means of the therapeutic test, i. e., the administration of quinine sulphate or "sweet quinine" in 3 to 5 gr. doses.

Treatment.—Quinine is a specific for malarial fever. Children take it in 2, 3, or 5 grain doses twice or three times a day. In order to disguise the bitter taste to some extent, it is best given in suspension in compound elixir of taraxacum or in honey. Fluid extract of licorice or elixir of yerba santa will also hide the bitter taste of quinine salts. After the medicine is swallowed, older children may taken a lemon candy into the mouth to still further hide the taste of the specific drug.

Sweet quinine (saccharinate of quinine) is now obtainable. It has about the same strength and therapeutic value as the bitter sulphate. It may be given in compressed tablets.

Euquinin is a quinine preparation adapted for children. It is given in the same dose as the sulphate of quinine.

TYPHOID FEVER IN CHILDREN

Typhoid fever is comparatively rare in infants, but it is more frequently met with in older children; it is usually of a mild character, although cases of a severe type do occur. The *diagnostic* features and *treatment* are similar to those in adults. (See Typhoid Fever.)

VULVOVAGINITIS

We observe three varieties of vaginal discharge in children:

A simple leucorrhœa is not an uncommon occurrence in anæmic or ill cared for little girls, and usually subsides as soon as local cleanliness and proper hygienic and tonic management are inaugurated.

The simple purulent vulvovaginitis, as observed in little girls, may be due to mechanical irritation, masturbation, worms, or uncleanliness, or may follow exanthematous diseases, and sometimes it arises without apparent cause. It shows no tendency to spread into the bladder or pelvis, but it is communicable and may give rise to inguinal adenitis, mild purulent ophthalmia, or a pustular eczema on account of scratching with unclean fingers. The distinction of the simple purulent vulvovaginitis from the specific, or gonorrhœal, variety is accomplished with the aid of the microscope.

Treatment.—The parts must be carefully cleaned by wiping the discharge away with moistened absorbent cotton and douching with a sal soda solution and afterward with sulphocarbolate of zinc, 5 per cent solution, or 5 per cent alum water. When the parts appear much irritated, stearate of zinc should be dusted between the labia. Worms, if present in the intestines, should be discharged.

Specific, or Gonorrhœal, Vulvovaginitis.—This variety is due to the presence of a diplococcus (see Laboratory Work), is highly contagious, and may give rise to severe gonorrhœal ophthalmia, suppurative inguinal adenitis (bubo), cystitis, pyosalpinx, pericarditis, pelvic or general peritonitis, and gonorrhœal arthritis with severe heart complications. In recent cases the infected vaginal mucous membrane is swollen, bleeds easily, is eroded in places, and is covered with a foul smelling purulent discharge.

Regarding the mode of infection, it may be stated that in children of both sexes the usual mode of infection is responsible for the disease in some few cases. The majority of cases may be traced to the child's sleeping in the same bed or playing with and touching a person suffering from gonorrhœa. In some instances soiled linen and water closet seats and infected catheters have been held responsible. Infection will often lurk in the vulvovaginal gland and its duct, in the urethral follicles, and in the deeper recesses of the vagina, although the more accessible, visible parts are in a healthy condition on ordinary examination. Thus, we have *latent*, or *unsuspected, vulvovaginitis, which may start up again at any subsequent time and give the impression of a new acute attack.* Therefore the presence of gonorrhœal discharge in a little girl, without marks of injury to the genitalia, does not prove a recent acute infection or that an assault has been attempted.

Treatment.—The parts must be cleansed frequently, as already described, and the vagina thoroughly swabbed with a 2 per cent protargol solution on a cotton carrier twice a day or a 2 per cent nitrate of silver solution. An atomizer may also be used to advantage, and over night a protargol suppository may be inserted into the vagina, gr. j to grs. v protargol of cacao butter. If the application of the disinfecting agent produces severe smarting, it may be applied in less strength.

The treatment after the first week should be less active, but should continue for from six to ten weeks. Even after the gonococcus has disappeared from the discharge relapses are frequent. During the time of treatment the child must wear a pad. Cases occurring in the wards of a children's hospital must be strictly isolated.

Vaginal douching with antiseptic solutions are occasionally followed by severe local pains in the pelvis and bladder, with a fever temperature. Careful douching with the fountain syringe but slightly elevated and the child in Sims's position is effective and devoid of danger. With proper treatment and when precautions as to complications are taken, the prognosis is good. A complete and rapid cure should not be promised. In young girls, in lieu of the fountain syringe for purposes of irrigation, a small soft catheter attached to a piston syringe should be employed. As an irrigation fluid permanganate of potassium, 1 to 4,000, may be used. At first two injections should be made daily; subsequently one a day; and finally two or three a week. After irrigation the parts should be dusted with stearate of zinc and a gauze pad applied.

The early detection of vaginal discharges of gonorrhœal origin in young children in day nurseries, kindergartens, and primary classes in public schools is of the utmost importance in preventing the spread of this malady and its complications, such as contagious ophthalmia, etc. To illustrate the dangers of gonorrhœal infection in children in public schools, the following authentic instance is cited: In a public institution in New York City harboring 850 children, 130 cases of so called leucorrhœa developed in two months, which proved to be gonorrhœal in nature. A large number of these children attended public schools. After numerous complaints by parents of children subsequently infected had been made, the matter was carefully investigated and proper isolation was effected.

MASTURBATION IN INFANTS (THIGH FRICTION)

An early recognition of this habit is important, inasmuch as the practice can easily be stopped in the beginning, whereas if it is neglected until the children are older, the habit is apt to become firmly established. Thigh friction can be prevented by any mechanical device which will keep the legs apart; but such a contrivance would be of no value in cases in which the child used its hand. For such cases a breech corset and leg separator combined would be necessary. Local irritation and irritation from highly acid urine should be recognized and treated, and general tonic management, including cold sponging, is indicated in cases of this nature. Masturbation in older children is overcome by tactful management by the parents and physician. Preputial adhesions are the most fruitful sources of local irritation.

FAMILIAR FORMS OF NERVOUS DERANGEMENTS PECULIAR TO EARLY LIFE

TICS; HABIT SPASMS; PAROXYSMAL RUNNING IN CHILDREN

Facial tics, facial nerve, spinal accessory, and hypoglossus spasms (trigeminal tics) are due to some central or peripheral irritation, as are also the bladder tics and heart twitching.

Habit Spasms.—Simple tics are under the control of the will to a certain extent. The muscles of the face, neck, shoulder girdle, arms, and legs are involved. Usually some source of irritation, such as adenoids or eye strain, can be elicited. They are annoying and very resistant to treatment, and may be associated with explosive utterances and cries and imperative ideas, or show as complex coordinated tics, such as head nodding and head banging.

Psychic tics, or **imperative ideas,** impelling the victim to touch a certain object or count a certain number, etc., are not serious.

Paroxysmal running is a morbid phenomenon of the explosive sort, suggesting cerebral excitation. The running may be in a straight line, in large circles, or irregular. There are two types: The first is associated with such diseases as epilepsy and mental derangement; the second is associated with chorea or hysteria. An underlying neurotic constitution is at the bottom of all tics, and in many instances some local irritation can be determined. Children of alcoholic and syphilitic parentage are prone to show tics. Anæmia and malnutrition intensify the liability to tics.

TREATMENT.—Neurotic children should not be overlooked at school, and should have cold douches up and down the spine, gymnastics, fresh air, proper food, and no intercourse with neurotic or violent individuals. In local tics the source of irritation, eye strain, phimosis, or adenoids must be remedied if possible. Local vibration and vibration along the spine are indicated.

HEAD NODDING AND NYSTAGMUS IN RHACHITIC CHILDREN

Under the titles spasmus nutans, nictitatio spastica, etc., writers have reported cases of clonic spasms of a group of muscles innervated by the accessory nerve, notably the sternocleido mastoid, trapezius, and recti capitis muscles. This muscular unrest may be unilateral or bilateral, and ceases during sleep. Nothing is known as to the ætiology of this condition. In severe cases of long standing the prognosis is unfavorable, and the treatment is limited to the removal of any form of reflex irritation which may be present or is supposed to exist, plus hygienic management and the medication recommended for rhachitic conditions. Two cases which came under the author's notice presented features not hitherto described (*Trans. of the Amer. Pædiatric Soc.*, 1889).

The first case referred to was that of a child eleven months old, in which the choreic movements were noticed by the mother on the day following an injury to the head by falling from a high chair. The muscles supporting the head were in such a state of unrest as to seriously interfere with the comfort of the child. The child soon became peevish, refused to take food, and became emaciated in appearance. A careful examination showed a marked rhachitic development and nystagmus of the horizontal type. The eyes were examined by competent ophthalmologists, Dr. Koller, Dr. Schapringer, and Dr. E. Fridenberg, and, excepting nystagmus, nothing abnormal was detected. It was furthermore noticed that if the child's attention was engaged by a shining object held at some distance above the level of the eye, the nystagmus and choreic movements would cease during such fixation. It was also apparent that the movements of the head were not the consequence of muscular weakness, but, on the contrary, it seemed as though they were due to a distinct effort on the part of the child for the purpose of visual fixation, made difficult by the existing nystagmus.

Treatment.—The application of an eye bandage suggested itself, and as soon as this was in such a position as to exclude every ray of light the choreic movements ceased completely; if, however, the bandage was so applied as to admit but very little light,the head movements persisted. This phenomenon was observed by a number of my colleagues, and could be reproduced at any time. Under such circumstances a permanent eye bandage suggested itself as a therapeutic procedure. The bandage was properly applied, and removed but once a week for cleansing purposes. The child was carried to the riverside daily, and was treated with salt baths and massage. The diet was regulated and phosphorus given internally. This treatment was faithfully carried out by the mother, and at the end of three months the nystagmus and choreiform movements had ceased, and the child was plump and healthy in appearance.

In a second child the symptoms manifested themselves after an attack of measles. At the time of its presentation there were moderate conjunctivitis, the nystagmus of the vertical type, and the movement of the head. The treatment and ultimate good results were the same as in the first case.

It appears from these observations that the localized tonic muscular spasms were either compensatory to the movements of the eyeball or reflex from irritation occasioned by the light to those structures which are concerned in carrying the impression. In view of the fact that the choreic movements ceased as soon as all light was excluded from the children's eyes, I am unable to formulate a more satisfactory explanation of the phenomena observed than the one I have expressed.

NIGHT AND DAY TERRORS (PAVOR NOCTURNUS ET DIURNUS)

Mild and severe cases of nightmare may be due to gastrointestinal or respiratory disturbance—*nasal obstruction.* In some instances of circulatory disturbances consciousness is lost and the little patient appears to have no knowledge of the attack on awakening. In most instances there is an underlying neuropathic anæmic constitution. In the management of such cases it should be remembered that ill ventilated, dark rooms, late meals, exciting games, and story telling before bedtime favor the attacks. When night terrors are of central origin, they do not yield to ordinary hygienic management, and must be regarded with gravity.

TETANY IN INFANCY (PSEUDOTETANUS)

In the present state of our knowledge tetany may be defined as symptomatic intermittent paroxysmal muscular rigidity occasionally observed (1) in rhachitic infants and children, (2) in cases of intestinal putrefaction and autointoxication, and (3) as an associated feature or sequel of acute infectious fevers. In a study of seventy-one cases reported by Dr. R. A. Peters (*Roussky Vratch,* September 14, 1902), the following symptoms were noted: 1. Contraction of the hands and of the feet. 2. Chvostek's symptom: Percussion with a hammer over the branches of the facial nerves produces a contraction of the facial muscles. 3. Erb's symptom: Increased electro irritability in the peripheral nerves. 4. Trousseau's symptom: Pressure upon the tendon of the biceps produces contractions in the muscles of the upper extremity that are quiet at the time of testing, or the contractions are increased in those muscles that are in activity at the time. 5. A sign which the author calls "jumping jack" symptom. It consists of motions of the lower extremities resembling those that result from the pulling of a string of a paper "jumping jack" when the galvanic current is applied to the portions of the spine that correspond to the lumbar and cervical enlargements, the anode being placed on the chest, the cathode on the spine. The strength of the current was from three to four milliampères. Erb's and Chvostek's symptoms were not found so constantly as the other signs, and were not pathognomonic.

Prognosis.—With proper management the majority of the patients recover.

Treatment.—Warm baths, enteroclysis, warm peppermint tea as a beverage, and proper food, together with mild massage, should be the therapeutic measures. In severe cases bromide of potassium, chloral hydrate, chloroform inhalations, and morphine subcutaneously, gr. $\frac{1}{30}$ to $\frac{1}{24}$, also subcutaneous injections of $\frac{1}{2}$ per cent carbolic acid water, 30 drops three times daily, may be used.

LARYNGISMUS STRIDULUS (LARYNGOSPASM)

Laryngismus stridulus is a laryngo respiratory spasm (neurosis) occurring in rhachitic children. It is characterized by a sudden holding of the breath with inspiratory stridulous breathing, and is common in children from one to two years of age. In severe attacks the patient becomes cyanotic and occasionally goes into convulsions. The attacks come on at odd times during the day and can often be provoked by passing the finger down into the throat. There is no fever, coryza, cough, or catarrh of any kind associated with this condition, except when the patient is afflicted with adenoids or large tonsils, in which case catarrhal symptoms are often observed. Enlargement of the thymus has been suggested as playing an ætiological rôle in laryngospasm. Very little experience will enable us to distinguish this form of *laryngismus* from *stridulous breathing* in catarrhal and membranous croup, *spells of whooping cough*, and hard *breathing spells*.

Treatment.—The attack can be cut short by dashing cold water over the abdomen. The *rhachitic* condition requires proper food, cold sponge baths, massage, change of air, and 10 drops of Thompson's solution of *phosphorus* three times a day. Bromides, chloral, and musk may be tried. *Adenoids* must be removed and the nasopharynx kept free by dropping salt water into each nostril three times a day or by using the albolene spray. In very severe cases the writer has employed vibration and tubed the larynx for hours or days, and apparently with good results. A fatal issue in laryngismus is a rare occurrence and comes unexpectedly.

ENURESIS; BED WETTING; INCONTINENCE

Enuresis, like convulsions, is a symptom. This annoying condition in children is too well known to require specification. It may be designated as a habit spasm of the bladder and may be nocturnal or diurnal. Leaving aside the cases of organic disease of the brain and cord (idiocy) and of malformations of the urethra and bladder, we may safely assume that enuresis in childhood must be classed as a neurosis to the extent that in individuals some form of reflex irritation produces the involuntary discharge of urine from the bladder. The conditions of malnutrition and anæmia frequently found associated with enuresis may and may not intensify the reflex irritability of an individual. It is well known that in extreme forms of malnutrition and marasmus there is a well marked obtuseness of the nervous system.

There are a great many varieties of enuresis. The following list embraces the ordinary conditions found in children in cases of enuresis. Malformations of the urethra and bladder and organic disease of the brain and cord (idiocy) are not included in the list.

Clinical Varieties of Enuresis.—Bed wetting with Digestive disturbances; large evening meal; a full bladder at night from too much water taken before bedtime; an abnormal condition of the urine, crystals in the urine; constipation; foreign bodies in the bladder, rectum, or urethra; a small meatus; phimosis, an adherent prepuce or clitoris, and elongated prepuce, a short frenulum; erosions and inflammations of the prepuce, glans, vulva, or urethra; warts of the glans, prepuce, or vulva; urethral caruncle; polyps, fissures of the rectum; worms in the rectum; masturbation, thigh friction; hernia, hydrocele; undescended testicle; adenoid vegetations, mouth breathing; cystitis (bacteriuria); bed wetting in diabetes, rhachitis; anæmia.

Prognosis.—Enuresis may last only a short time or continue on and off up to puberty.

Treatment.—There is no routine treatment for enuresis and it is a fallacy to look around for a *drug* which will cure bed wetting.

1. The main point is to combat the neuropathic constitution and malnutrition by cold sponge baths, proper feeding, general massage, and exercise in the fresh air.

2. To examine the blood for anæmia and, if it is present, give iron and arsenic, and order fresh air and a daily flushing of the colon with warm saline solution.

3. To look for and remove if possible local irritation as pointed out in the list of Clinical Varieties.

4. If no local disturbance is detected, it is admissible to pass a clean sound and stretch the urethra, which is sometimes the seat of invisible erosions, stricture, or spasm.

5. Bromide of potassium and belladonna may be given after all else has failed to relieve the excessive irritability of the nerve centres, also chloral hydrate.

6. Some relation between mouth breathing and bed wetting exists. Large tonsils and adenoids should be removed.

7. Elevating the foot of the bed at night sometimes overcomes enuresis by taking away irritation from the neck of the bladder. Hot sitz baths may be given before bedtime, and vibration along the spine and over the bladder may be applied every other day.

CONVULSIONS IN CHILDREN

Convulsions are symptomatic of some disturbance, but may be treated from the clinical standpoint as a separate affection. In children clonic convulsions are always accompanied by loss of consciousness; in adults convulsions may be simulated. Older children of neurotic environment and constitution may have tonic contractures without true loss of consciousness. We speak of tonic and clonic, general and localized, convulsions. Convulsions are common in rhachitic, neurotic, tuberculous, and syphilitic children. On the other hand, long continued profound malnutrition shows an obtuseness of the nervous system. Congenital contractures point to convulsions in utero.

Motor discharges have their origin in the nerve cells, in the cortex, at the base of the brain, in the pontobulbar region and Rolandic cortical area, in the ganglion cells of the brain, or in reflex centres in the pons and medulla. An autopsy generally shows no changes except hyperæmia, and the real changes are probably in the cells. Irritation of the motor centres may be *direct*, as in: Injuries at birth; hæmorrhage; tumors; abscess; thrombosis; embolism; encephalitis; meningitis; sunstroke, etc.; or irritation of the motor centres may come *indirectly* through the circulation, as in: Anæmia of the brain; hyperæmia or venous congestion, as in heart disease, asphyxia, laryngismus, and pertussis; uræmia; poisons, vegetable, mineral, animal; toxines, infectious fevers; autointoxication from poisons formed in the intestines, urine, or blood (paraxanthin, acetone, etc.).

Irritation of the motor centres may come as a simple reflex irritation, as from a foreign body in the nose, ear, pharynx, etc.; earache; gastrointestinal irritation, colic; fright, anger, burns, wounds; retention of urine; renal and intestinal colic, etc.

Convulsions in infectious fevers have a twofold significance. At the onset they denote overwhelming toxæmia, but do not necessarily involve a grave prognosis. When convulsions set in at the termination of a severe illness, it means some complication or circulatory failure, with inanition of the brain. During the convulsive attack the temperature may be normal or elevated. A convulsive seizure may be followed by coma, semicoma, rigidity, or paralysis, and occasionally death.

Prognosis.—The prognosis is governed by a knowledge of the exciting cause.

Treatment.—In the majority of cases convulsions in children are due to some gastrointestinal disturbance or to the onset of an acute infectious disease. The momentary treatment is entirely symptomatic. In many instances such *prodromal conditions* as twitching with restlessness and high temperature will warrant the administration of a bath and an enema. A child in a *paroxysm* should receive an enema at once, and be put into a bath 100° F. After removing the patient from the bath, an ice cap is applied to the head and the patient put to bed and kept quiet. Should the convulsions return, the bath and enema are repeated, and chloral hydrate with potassium bromide (each, gr. 1 to 3) may be given by the mouth if the patient is conscious, or by the rectum if he is comatose. If a very high temperature is present, hydrotherapeutic measures for reducing temperature are indicated, or a single dose of antipyrine in water may be given per rectum.

In obstinate and prolonged convulsive seizures the inhalation of chloroform and the hypodermic administration of morphine (gr. $\frac{1}{48}$ to $\frac{1}{18}$) are justified. If, on the other hand, the convulsions are caused by heart failure, camphor, strychnine, whiskey, and digitalis may be given subcutaneously in connection with enteroclysis. After the child's recovery from an attack the physician will direct his attention to any underlying or predisposing cause. In obscure cases it may be advisable to tap the spinal canal for diagnostic purposes.

CHOREA (ST. VITUS'S DANCE)

Chorea belongs to the group of psychomotor neuroses of unknown origin, and occurs most frequently between the ages of five and fifteen. It is a disease characterized by irregular and involuntary muscular movements without loss of consciousness, affecting the muscles of volition, frequently associated with *systolic heart murmurs*, and having some obscure connection with endocarditis and rheumatism. As the origin and pathology of chorea are still a terra incognita at the present time, its ætiology will not be discussed here beyond stating that overpressure at school and fright are important factors in its production, and that neurotic, anæmic, and ill nourished children are most liable to be afflicted.

Clinical varieties of chorea are symptomatic chorea, caused by material lesions in the brain; reflex chorea, due to reflex irritation, and idiopathic chorea, due to infectious and toxic influences, e. g., rheumatism. The last variety is the most frequent and important, and may be looked upon as an infectious disease or intoxication by the products of pathogenic bacteria.

Symptoms and Course.—Chorea may be general or partial. Its course may be acute, subacute, or chronic. It rarely affects children under five years of age. The attack comes on gradually, as a rule. The child appears nervous and depressed, drops things held in the hand, or stumbles and falls or makes grimaces. Such manifestations may be one sided (hemichorea). The child is irritable and emotional and has difficulty in speaking. There is tongue tremor with inability to hold the hand out straight and motionless. Systolic heart murmurs are frequently heard.

In the so called posthemiplegic "chorea," the muscles are rigid and contracted and the reflexes are increased.

PROGNOSIS.—Complete recovery is the rule. Acute chorea plus endocarditis may terminate fatally. The prognosis in cases complicated by a cardiac murmur should be guarded. Relapses of the choreic condition are not infrequent.

Management and Treatment.—A child affected with chorea should be put to bed and have no visitors or excitement, but be in charge of a competent person to entertain and nurse him. A daily bath and daily soap suds enema are to be given. Should the child not get sufficient sleep, a dose of chloral and bromide must be administered at night. A light and nutritious diet must be arranged. Palpitation of the heart with some fever *may* indicate the administration of

℞ Sod.. salicyl.,	ʒj;
Potass. iodid.,	ʒss.;
Tinct. aconit. rad.,	gtt. xvi;
Aquæ et syrup, ad.,	℥ij.

M. S.: A teaspoonful every two hours.

Fowler's solution of arsenic, gtt. 2 to 5, in combination with 5 grains of bromide of potassium, may be administered in water three times a day. With a view to combating endocarditis, which is a frequent complication of chorea, an ice bag may also be placed over the chest.

After recovery the child should be sent to the country or seashore, and have mild general massage. In mild cases the children should be taken from school and given a change of air. When arsenic has been given to the point where gastric symptoms are manifested, its administration must be discontinued, and the following digestive may be given:

℞ Acid. hydrochloric, or dil.,	ʒj;
Tinct. gentian, comp.,	ʒj;
Ess. pepsin.,	℥iij.

M. S.: A teaspoonful after eating.

The use of arsenic may be resumed after the tongue is clean. In some cases vibration over the spine every other day for ten minutes has been followed by satisfactory improvement.

THE PARALYSES OF INFANCY AND CHILDHOOD[1]

Obstetrical paralysis of the face or arm is caused by injuries inflicted during labor, and is discussed in the section of diseases of the new-born.

Little's disease is a congenital spasmodic paraplegia of the extremities, particularly the legs, capable of improvement and cure by general hygienic management and mild massage, though if syphilis is the underlying cause, mercury should be administered.

Infantile Spinal Paralysis (Acute Anterior Poliomyelitis.).—This ailment is most frequent between the ages of one and four years, and must be looked upon as an acute infection localized in the cord. The disease occurs sporadically and in epidemics. The onset is usually sudden, with fever, vomiting, diarrhœa, and prostration. Paralysis sets in shortly after the onset. When children are taken sick in the afternoon, the paralysis is generally manifest on the following day. There are no disturbances of sensation and the intelligence remains intact. One side or both sides may be paralyzed at the onset, but after a few months, even without treatment, we find the paralysis limited to a few muscles of one leg or arm. The muscles are soft, never rigid, and show no tendon reflex, thus contrasting sharply with the rigidity of cerebral paralysis. Atrophy in infantile spinal paralysis is also marked. The lesion affects the growth of the paralyzed limb, and the joints become lax. It has been noticed that those muscles recover which respond to the faradic current. The total absence of sensory symptoms is also characteristic of infantile spinal paralysis.

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[1] See also Neurological Memoranda.

DIFFERENTIAL POINTS.—In discriminating between anterior poliomyelitis and multiple neuritis following infectious disease (diphtheria and influenza), it will be well to remember that in the latter lesion the limbs are affected symmetrically, the muscles are tender, and in fact the sensory symptoms are severe. Paralysis, atrophy, reaction of degeneration, and loss of tendon reflex are present in both.

TREATMENT.—The object is to increase the nutrition of the limb and protect it from injury. The paralyzed limb is cold and should be well wrapped during cold weather. Massage, gymnastics, hot and cold douches, and the interrupted or galvanic current and vibratory massage are indicated. If a brace is applied, it must be light and not cumbersome. Orthopædic surgery has been invoked to overcome the paralytic club foot and contractures by tendon grafting and shortening of tendons and nerve anastomoses, and some noteworthy results have been obtained.

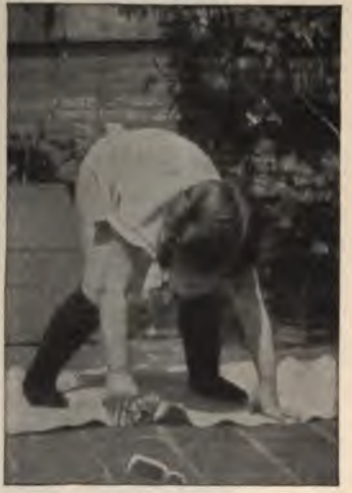

FIG. 92. — PSEUDOHYPERTROPHIC MUSCULAR PARALYSIS.
Trying to get up.

Infantile Cerebral Paralysis with Retarded Development (Spasmodic Infantile Hemiplegia.)—Beginning more or less with brain manifestations, fever, delirium, convulsions, spasm, the paralysis is of the hemiplegic type, with rigidity, contracture, and exaggerated reflexes. The electrical reactions are normal, and there is no rapid or extreme wasting. Athetoid movements are noted in some cases, also posthemiplegic chorea. Protracted labor, instrumental injury, asphyxia, acute infection (scarlatina, diphtheria, cerebrospinal meningitis), cysts, and areas of softening and sclerosis are ætiological factors.

PROGNOSIS.—Facial paralysis generally disappears, the leg improves, and the arm remains disabled.

The TREATMENT is the same as in the spinal paralysis, and in cases of doubtful origin the patient should have the benefit of the doubt and be given an inunction cure.

Primary Myopathies.—*Pseudohypertrophic muscular paralysis* and *atrophic myopathies* are forms occurring in late childhood, usually beginning between the ages of two and eight and affecting both sexes. Some form of motor weakness is generally the first symptom, and the way in which the patient raises himself from the horizontal to the vertical position is characteristic of the lesion. Owing to weakness of the extensor muscles of the knee, he places his hands on the lower part of the thighs and gradually raises himself upward by this assistance. The posture and gait are characteristic. When the patient is standing, the abdomen projects, the back is hollow, the buttocks are thrown back, the feet are planted apart, and the gait is swaying and waddling. There is feeble response to both currents of electricity.

The PROGNOSIS of myopathic disease (atrophy or pseudohypertrophy) is not favorable. After the power of standing is lost, the case is practically hopeless, but no case should be pronounced hopeless until treatment has been persisted in on the following lines and with a view of exhausting the "specifics" before we give up all hope:

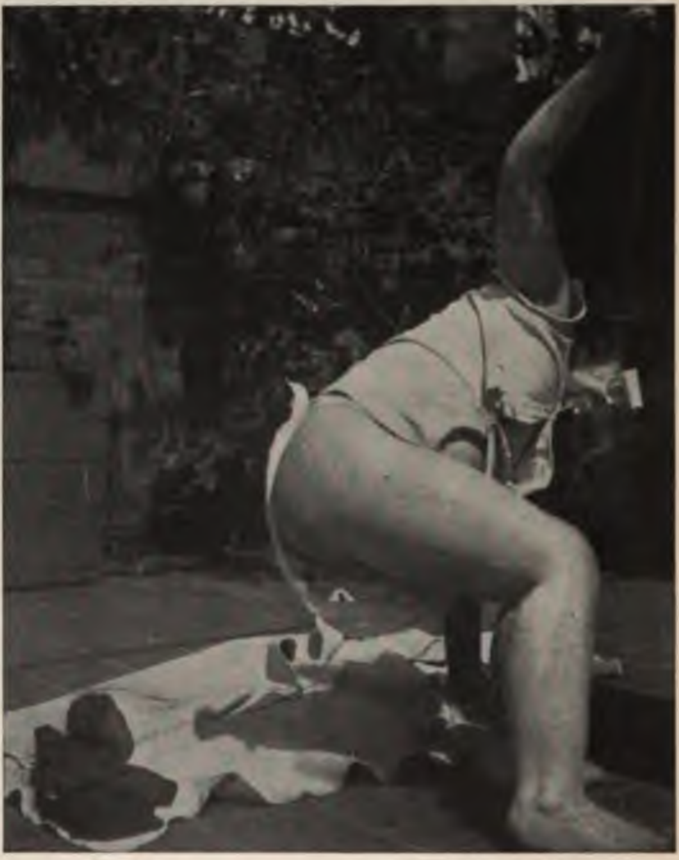

FIG. 93.—PSEUDOHYPERTROPHIC MUSCULAR PARALYSIS.
Showing characteristic posture in trying to rise.

Open the bowels to eliminate autoinfection from the intestine.

Give general mild massage and baths to better the circulation.

A course of antimalarial treatment, even if the plasmodium is absent from the blood, may be given.

A course of antisyphilitic treatment, with mercury and with potassium iodide.

A course of antirheumatic treatment with sodium salicylate.

A course of treatment with thyreoid preparations.

A course of treatment with suprarenal preparations.

Pott's paralysis is common in childhood. It follows disease of the dorsolumbar vertebræ, and its management is discussed under Orthopædics.

Diphtheritic Paralysis.—Postdiphtheritic paralysis may affect the muscles of the palate, the oculomotor muscles, the diaphragm and respiratory muscles, the muscles of the extremities (ataxia), and the heart muscle.

The DIAGNOSIS is easy when the previous occurrence of diphtheria is known. Important symptoms are dysphagia, food regurgitation, a nasal voice, and a weak, loose cough. Primary paralysis of the palate has occurred as late as on the sixty-fifth day, primary oculomotor paralysis on the ninety-first day, and primary paralysis of other parts on the fifty-first day. Most of the cardiac paralyses occur between the fifth and tenth days; a few cases have occurred even as early as on the second day, while this condition has occurred in a severe form (that is, ending fatally) in two cases on the fifty-fourth day and in one case, which ended in recovery, on the fifty-ninth day.

The TREATMENT of these conditions is discussed in the chapter on Diphtheria.

Pseudoparalysis in syphilitic, rhachitic, and scorbutic children is frequently observed. The extremities are affected, the sphincters are free, and the electrical examination is negative. In syphilis and scurvy pain is excited by moving the limb. In rhachitis the muscular weakness simulates paralysis.

The TREATMENT is hygienic and dietetic, also specific in cases of known or suspected syphilis.

Syphilitic Paralysis of Peripheral Origin.—*The diagnosis* of this condition rests upon the fact of the integrity of the bones and upon the modified electrical reaction. When the signs of syphilis are not evident, the distinction from infantile paralysis is made by the fact that the latter occurs suddenly, with fever, generalization of the paralytic phenomena, and absence of pain.

Painful paralyses, or paresis in neuritis, may occur in children as well as in adults, usually from infection. The diagnosis is made from the pain and the rapid onset of the affection conjoined with the fact that there is no lesion of the joints or bones.

Paralysis in the convalescent period of measles is of the paraplegic type, lasts about six weeks, and usually ends in recovery.

Choreic paralysis is usually of the hemiplegic or monoplegic form, and most frequently occurs while chorea is present or during convalescence.

Friedreich's disease, or hereditary ataxia, does not present phenomena of motor incoordination; there are nystagmus and disturbances of speech. It is not a congenital affection. The fulgurating pains, anæsthesia, and trophic disturbances of locomotor ataxia are wanting. Vertigo is present.

Painful Paralysis of Young Children.—It is occasionally noticed that after a jerk or a twist an arm or leg is perfectly flaccid, and the children cry when the least movement is made, although there are no anatomical changes to be observed. Passive movements are perfect and ecchymoses are absent. Recovery is rapid, occurring in from one to eight days. Such injury is probably of the nature of traumatic neuritis, and mild daily massage is all the treatment that is necessary.

Hysterical Paralyses.—In this form the reflexes are not abolished and the diagnosis is made by exclusion.

The Causes which may Retard or Prevent Walking in Children.—The majority of children begin to walk between the tenth and sixteenth months, a few at eight months, and the most backward at the end of the second year, Any child who is unable to walk by the end of the second year will usually be found to be the subject of a pathological condition. The diseases which render a child unable to walk, or retard or otherwise interfere with that function, are rachitis, cerebral atrophy, cerebral sclerosis, hydrocephalus, meningitis, spasmodic hemiplegia, cerebral or cerebellar tumors, amyotrophic lateral sclerosis, hereditary ataxia, infantile paralysis, chorea, and sometimes hysteria. In the diseases of the muscles there are also two which have a decided influence in interfering with the function of walking—pseudohypertrophic paralysis and a form of myopathy which begins in the lower limb. Lesions of the bones and joints have also an important bearing in this direction—namely, fractures, congenital or traumatic luxations, arthropathies, club feet, Pott's disease, and rhachitis.

MENINGITIS IN CHILDREN

The meninges respond to irritation like other serous membranes, and may become the seat of primary or secondary inflammation, accompanied by serous or purulent effusion. The same species of microbe which produces a pneumonia or pleurisy may start a meningitis or synovitis, according to its localization. The infecting agent may reach the meninges through the blood or by extension from the nasopharynx, the ear, or the eye. Meningeal symptoms, such as delirium and slight rigidity of the neck, are often observed in acute infectious diseases. These are toxic phenomena (toxæmia), and must not be confounded with true meningitis.

Simple acute meningitis is an infection of the pia mater by various microorganisms, including the *pneumococcus lanceolatus*. It may be primary or secondary to any form of infectious disease. The infecting agent may reach the pia through the circulation, or may be communicated by extension of a neighboring inflammatory process. The exudate may be *serous* or *purulent*. When the exudate is absorbed, the membrane may remain thickened, as in pleurisy, and imbecility or idiocy result.

The **cerebrospinal meningitis** is distinct clinically from the first mentioned variety, on account of its localization, as shown by the name, and because it shows a higher percentage of recoveries than any other variety of meningitis. It is looked upon as a diplococcus invasion of the membranes of the brain and spine, and occurs sporadically and epidemically.

Tuberculous meningitis is an infection of the meninges by tubercle bacilli in the form of gray miliary tubercles. It is of frequent occurrence in children of two, four, or six years of age, and is also seen in older children. It is generally secondary to tuberculosis of some other organ, but clinically it impresses one as starting primarily in the brain. Often there is a history of traumatism which seems to be the starting point of the disease. Infection takes place through the circulation or by extension from tuberculous ear disease or from tuberculous glands. The nasopharynx is believed to be a portal of entrance.

Symptoms and Signs of Meningitis in General.—General malaise, drowsiness, vomiting, constipation, stiff neck and back, loss of control of the bladder and rectum, convulsions, delirium, coma, set eyes.

The temperature ranges from 101° to 105°, 106°, and 107° F., or higher. The pulse at first is rapid, then irregular and slow. Cheyne-Stokes respiration is often observed.

Symptoms of Tuberculous Meningitis.—First stage. The onset is usually gradual. General irritability, loss of appetite and weight, pallor, low fever, and poor sleep are noted. These symptoms may extend over two or three weeks.

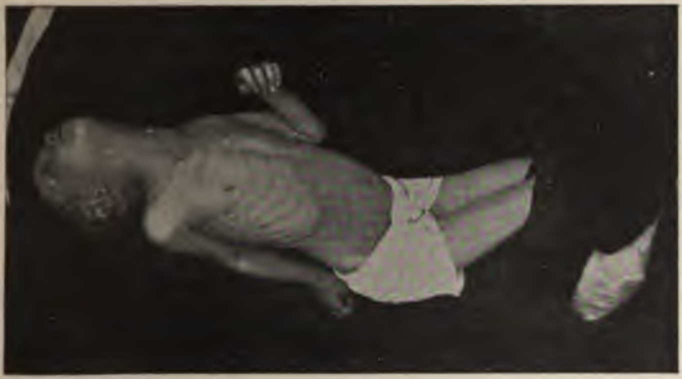

FIG. 94.—CEREBROSPINAL MENINGITIS.

Second stage. Excitation, vomiting, convulsions, irregular pulse and temperature, tache cérébrale, rigidity, tremor, and contracture.

Third stage. Depression. Large, rigid pupils, slow, arrhythmic pulse, sighing respiration, strabismus, oscillating eyeballs, injected conjunctiva, hydrocephalic cry, Cheyne-Stokes respiration, delirium, convulsions, death.

DIFFERENTIAL DIAGNOSIS.—In discriminating between the three forms of meningitis it will be well if we bear in mind that all the symptoms spoken of are the usual ones of a group of pathological conditions which we class under the heading of encephalo-meningitis, the ætiology of which embraces a variety of causes.

1. Primary microbial infection, including the tuberculous variety.
2. Secondary microbial infection, following any form of acute or chronic infection, including syphilis.
3. Extension of a neighboring inflammatory process in the ear or nose, panophthalmitis, intracranial abscess, tumors, etc.

When we are face to face with illness in which meningeal symptoms are noticeable, the first practical and important point to decide is as to whether or not there is meningitis. The question cannot be decided by taking into consideration any group of symptoms. A careful weighing of all the evidence is necessary.

Vomiting, delirium, muscular rigidity, as symptoms of toxæmia, are just as pronounced in some cases of pneumonia, influenza, or eruptive fevers as in acute true cerebral or spinal meningitis. Malaise, vomiting, constipation, low muttering, grinding of the teeth in sleep, injected conjunctiva, irregularity of the pulse, and sighing respiration are symptoms of long standing intestinal inertia and autoinfection as well as symptoms of tuberculous meningitis.

In meningitis we can generally elicit the *tâche meningitique*, or Trousseau's sign, by drawing the finger nail sharply over the skin. Owing to vasomotor disturbances the red irritation mark comes slowly and disappears slowly.

KERNIG'S SIGN.—In cases of meningitis it is usually impossible for a patient lying on his back to flex the thighs upon the body without flexing the knee at the same time, and complete extension of the legs is impossible.

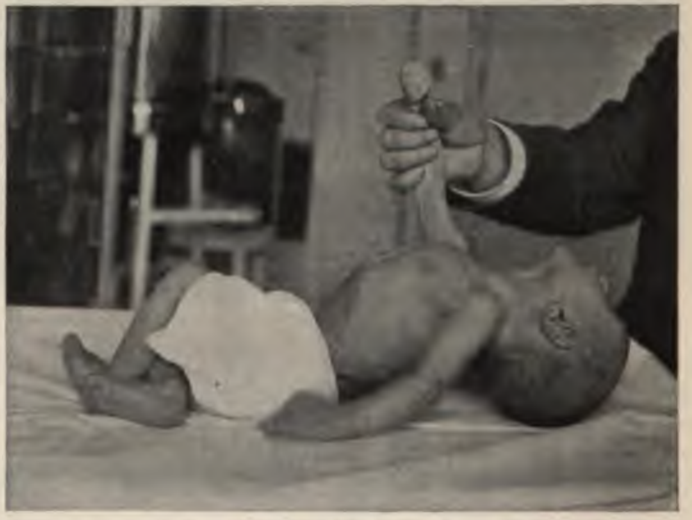

FIG. 95.—MENINGITIS.

Both Trousseau's and Kernig's signs are occasionally found in patients not suffering from meningitis, and their absence does not positively exclude the diagnosis of meningitis.

SPINAL PUNCTURE.—The cerebrospinal fluid obtained by puncturing the spine is cloudy or turbid in acute meningitis. In several cases of meningitis the writer has withdrawn pure pus by spinal puncture repeatedly, one child living three weeks in this condition. In tuberculous meningitis the fluid is very clear. The tubercle bacilli can seldom be found in the fluid by microscopical examination. If present, they are detected by the culture and inoculation tests.

The **prognosis** is grave. Meningitis may progress for weeks and terminate in recovery or death. When recovery occurs, blindness, muscular paralysis, speech defects, and defective intellect may remain. Meningitis may terminate in complete recovery. In the so called intermittent cases of cerebrospinal meningitis the prognosis is not unfavorable, and patients may recover completely from a clinical standpoint.

In tuberculous meningitis the prognosis is unfavorable.

The usual types of cerebrospinal meningitis are the *mild*, *subacute*, *rapidly fatal*, *intermittent*, and *chronic*.

Treatment of Meningitis.—After the diagnosis is established, the treatment is symptomatic. Ice coil to the head; warm mustard baths, cool sponge baths. Fever diet: Milk, gruels, broths, tea, beef tea, eggs. Inunctions of mercurial or Credé ointment, 1 drachm twice daily. A daily enema of soap water or salt water, 1 drachm to 1 pint. Catheterism of the bladder in cases of retention of urine. Feeding by gavage in coma. Feeding per rectum. Spinal puncture to relieve pressure symptoms. Stimulation p. r. n. Tincture of iodine to check vomiting, 1 drop in sweetened peppermint water every two to three hours. Sodium salicylate, 5 to 20 grains, in water, per rectum, three times a day.

A so called fever diet is essential in all febrile disease or conditions. The food should be fluid or semisolid, so as not to overtax the feeble digestive apparatus or leave a large residue in the intestine for decomposition, which would be apt to favor autointoxication or local irritation.

For older children, who no longer take the bottle, we may select food from the following list: Water, toast water, farinaceous water, gum arabic water, white of egg in water, peppermint tea, imported ginger ale, black tea, milk, matzoon, kumyss, buttermilk, whey, sterilized, Pasteurized, or peptonized milk, malted milk, beef broth, mutton broth, chicken broth, with and without eggs, beef jelly, soups, gruels, cornstarch pap, pea soup, burnt flour soup, eggnog, tropon or somatose in peppermint tea, custard, ice cream, water ices, orange or pineapple juice, unfermented grape juice, etc.

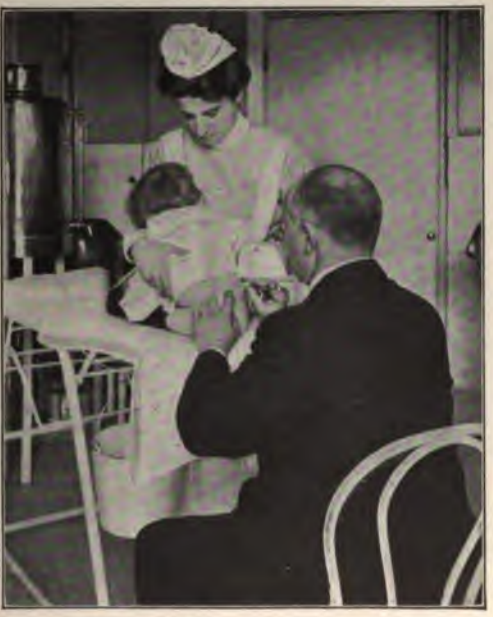

FIG. 96.—SPINAL PUNCTURE. FORWARD BICYCLE POSITION.

INDICATIONS FOR GAVAGE.—When the patients refuse to take food or are comatose and when rectal alimentation is inadequate.

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[1] Seibert claims excellent results from large doses of sodium salicylate 30 grains three times a day per rectum.

Rectal Alimentation.—*Nutrient Enemas.*—Feeding by the rectum is useful in feeble digestion and in cases in which food is not tolerated by the stomach or to supplement a feeble stomach or in inability to swallow, etc.

Antipyretic Measures.—Where the temperature is very high a warm bath (95° to 100° F.) may be given, and cold water may be added to the bath until the temperature is reduced to 75° F., or a cool sponge bath may be given several times a day, supplemented by an ice bag to the head. Drug antipyretics are hardly ever called for.

Cerebral restlessness is best treated by cooling baths and by chloral hydrate, and bromide of sodium by the mouth or per rectum.

Stimulation is best accomplished by means of enteroclysis (high enemata of salt water at 110° to 120° F.). Of stimulant drugs, we may employ camphor and strychnine. Camphor may be given in one-half to one grain doses, hypodermically, dissolved in oil (one fifteenth).

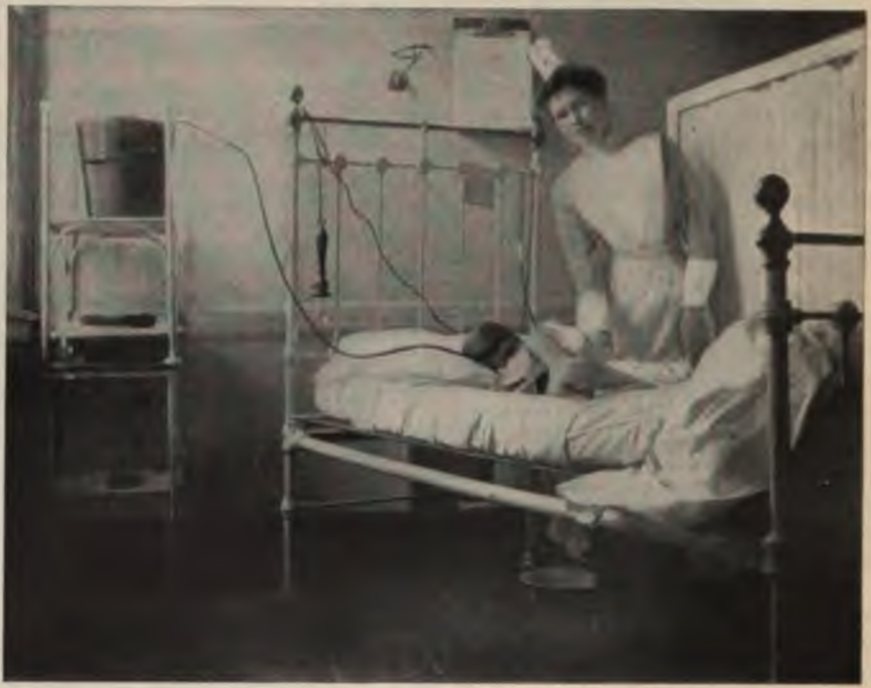

Fig. 97.—Ice Water Coil in Meningitis.

Local Treatment.—In meningitis local treatment has been attempted by the author by injecting iodoform, potassium iodide, and sodium salicylate into the subarachnoid space without beneficial results.[1] Patients with cerebrospinal meningitis frequently recover after the administration of salicylate of sodium and bromide of potassium internally.

In 1902 Seager, of Lisbon, suggested local treatment in cerebrospinal meningitis by means of lumbar puncture and injections of 10 c.c. of a

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[1] *Trans. of the Am. Pæd. Soc.*

1 per cent solution of lysol. It has not proven of value in the author's experience.

HYDROCEPHALUS

Hydrocephalus may be congenital or acquired.

Congenital Internal Hydrocephalus.—We do not know the cause. It has been noticed in several members of the same family. *Syphilis* is an undoubted factor. It is principally the lateral ventricles which are affected, and they may be so distended as to thin out and stretch the cerebral cortex over them to less than a quarter of an inch in thickness. The skull becomes enormously enlarged, the sutures and fontanelles are widely distended, the bones of the cranium are thinned, and the orbital plates may be so pressed forward as to cause exophthalmus. The distending fluid is clear and contains traces of albumin and salts and sometimes urea.

Labor may be interfered with by the large head. In some cases the head does not become enlarged until several weeks after birth. Irritability and restlessness are prominent symptoms. The child is usually not bright mentally and most generally shows some degree of imbecility. The legs may be feeble and show exaggerated reflexes, making it difficult for the child to learn to walk. Strabismus and optic nerve atrophy may develop, and nystagmus is usually seen. Ultimately there are convulsions, vomiting, and coma, and the child seldom lives to be more than three or four years old.

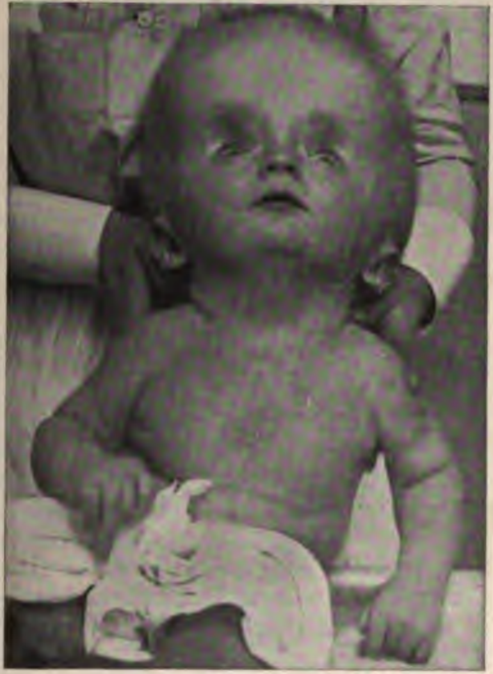

Fig. 98.—Hydrocephalus.

Acute hydrocephalus (serous meningitis), alluded to under simple meningitis, is often secondary to a basilar meningitis. There is rarely very great distention, about three or four ounces of water being present usually.

Acquired Internal Chronic Hydrocephalus.—The causes are compression or obliteration of the straight sinus or of the passage from the third to the fourth ventricle by a tumor or some obstructing local inflammation *following a meningitis*. Some cases arise without known causes (serous apoplexy).

Symptoms.—They are obscure; headache, optic neuritis proceeding to atrophy, and attacks of stupor are usually noticed. The head does not enlarge, and there are no localizing symptoms. The diagnosis is seldom made during life.

Treatment of Hydrocephalus.—This is largely mechanical. Gradual compression may be made by means of strips of adhesive plaster crossed in various ways. The symptoms of pressure may be relieved by withdrawing small quantities of fluid from the ventricles from time to time by means of an aspirating needle. Lumbar puncture of the subarachnoid space, permitting a slow escape of the fluid, may be practised without risk to the cord and without much danger of collapse. Medicines are apparently useless, although mercurial inunctions and potassium iodide may be tried in cases of suspected syphilis. Drainage by means of a silver cannula connecting a ventricle with a vein has been practised without satisfactory results.

Chronic external hydrocephalus is exceedingly rare, and probably is always secondary. It is associated with some congenital malformation or atrophy of the brain, and may follow meningeal hæmorrhage or pachymeningitis. The fluid is confined beneath the dura mater, which, when incised, allows of the escape of a few ounces, sometimes as much as a pint. There is flattening of the convolutions, and sometimes there is atrophy. Some internal hydrocephalus may be present. The fluid may cause enlargement of the head, separation of the sutures, and in fact most of the appearances of the internal variety. As a rule, it is not severe enough to give rise to any decided symptoms.

DISORDERS OF SPEECH; STAMMERING, STUTTERING, AND LISPING

When disorders of speech take their origin in the nerve centres, treatment or training will avail but little. When tongue tie, adenoid vegetations, irregular teeth, or cleft palate are causes, the stammering, stuttering, and lisping are easily remedied. Systematic teaching and training may overcome speech defects when they are due to a failure on the part of the vocal organs to cooperate with those of articulation. Tremor following severe acute illness or nervous shock or overwork or general debility will require constitutional treatment.

HYSTERIA IN CHILDREN

Hysterical Paralyses, Aphonia, Neuralgia, Contractures, Hyperæsthesia, Holding the Breath.—Psychical, sensory, and motor phenomena of a morbid character are common from infancy through childhood in anæmic children having neurotic parents or neurotic surroundings, in the offspring of alcoholics, and as complications of acute disease. Hysterical manifestations are possible as soon as the child has acquired the capacity to receive impressions and develop conceptions.

In discriminating between hysteria and organic disease it is a great mistake to underestimate the shrewdness of a child, and the physician will readily deceive himself in diagnosis and thwart himself in the way of moral treatment if he unthinkingly makes the child or its hysterical mother a confidante of his views.

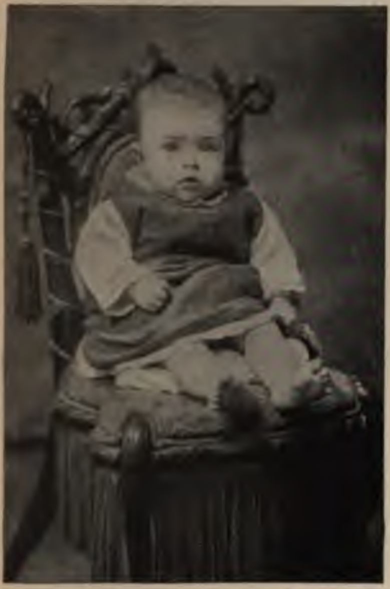

Fig. 99.—One year old.

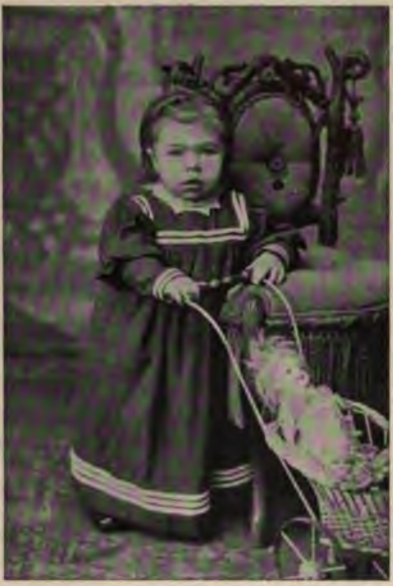

Fig. 100.—Same child. Pronounced cretin at two years.

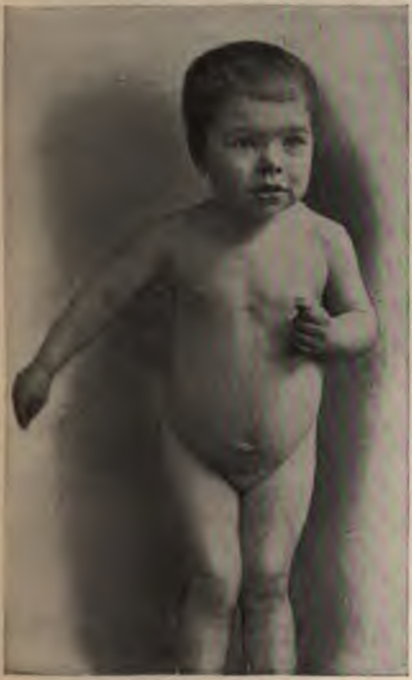

Fig. 101.—Same child. Four weeks after treatment with thyreoid.

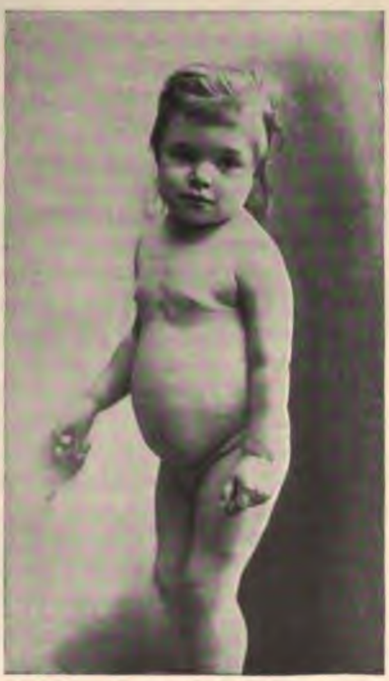

Fig. 102.—Same child. Ten weeks after treatment with thyreoid.

FIGS. 99-102.—SPORADIC CRETINISM. (Case of Dr. H. B. Sheffield.)

Hysterical and epileptic conditions blend and alternate, and the line of demarcation is exceedingly vague. It is therefore useless to go into details regarding diagnosis, because such matters will be decided by the acuteness and tact of the medical attendant, and not by a pen picture of conditions by no means clear cut.

PROGNOSIS is good, but there is a tendency to relapse.

TREATMENT.—Rational hygiene and the handling of hysterical children by a kindly, firm, and intelligent woman is a *conditio sine qua non* of successful management. Self-control must be developed. Massage, cold baths, and gymnastics are indicated, and punishment is often a necessary feature in the treatment. As chronic intestinal indigestion is at the bottom of many ailments, every effort should be made to secure normal digestion for the child.

MENTAL DEFECTS FROM ARRESTED DEVELOPMENT

Idiocy; Imbecility; Cretinism; Mutism

The idiot represents the lowest expression of human intelligence. In the scale of mental power and activity the imbecile stands between the idiot and the feeble minded, and about 5 per cent of imbeciles present the so called Mongolian type of imbecility. Such conditions are congenital or acquired. Imbeciles and feeble minded children may be developed along the line of their unimpaired faculties by special training if removed from the influence of neurotic parents. The mentally deficient are divided into the three following classes: 1. Congenital mental deficiency in its various forms of microcephalus, hydrocephalus, the Mongol type, scrofulous cases, birth palsies with athetosis, cretinism, and primarily neurotic cases; 2. Developmental cases; 3. Accidental or acquired cases, consisting of traumatic, postfebrile, emotional, and toxic varieties.

Mutism may depend upon absolute deafness, mechanical defects of the speech apparatus, or mental defects.

It is not generally realized how much moderately deaf children are handicapped in the acquisition of language and general information.

Cretinism is faulty development in connection with some abnormality of structure or function of the thyreoid gland. Thyreoid medication has achieved some remarkable results in cretins, and has been of some benefit in imbeciles and feeble minded children in which the signs of cretinism are absent. From two to five grains of the powdered desiccated sheep's thyreoid gland may be given for a long time. (See also Diseases of the Ductless Glands.)

Amaurotic family idiocy is the unfortunate name given to a symptom complex of brain degeneration in which inability to hold the head up and blindness are the marked features. Children so afflicted generally die before the age of two. The treatment is symptomatic and unavailing (see also Neurological memoranda).

CHAPTER IV

THE DIGESTIVE SYSTEM

NUTRITION AND DIET

SYNOPSIS: Introductory Remarks.—Digestibility of Food.—The Absorption of Food.—Constituents of Food.—Fuel Values of Food.—Tables of Calories (Fuel Values).—Practical Dietetics.—Fluid Diet; Soft Diet; Full Diet; Restricted Diet; Fever Diet, etc.—Stimulants and Beverages: Alcoholic, Non-Alcoholic, Mineral Waters.—Predigested Food.—Concentrated Food.—Systems of Diet: Banting, Ebstein, Oertel, Schwenninger, Weir Mitchell.—Vegetarianism.—Exercise and Diet.—Tobacco and Digestion.

INTRODUCTORY REMARKS

THE general practitioner is constantly confronted with the question of what foods shall be allowed or not allowed in the management of various acute and chronic disorders, and there is probably no subject related to the practice of medicine in which there is a greater lack of agreement than that of nutrition and diet. Nervous dyspeptics are kept upon a liquid diet until they are wrecks, young children and adults are fed with pancreatized food until the gastroenteric tract is foul and putrid, green salads are prohibited to convalescents whose system craves them, and in general the patient encounters such a complexity of diet regulations as to thoroughly bewilder the unfortunate individual who runs the gamut of a number of medical men. For this reason the writer has thought it proper to devote some space to practical dietetics. In developing rational dietetics we are guided by our known principles of metabolism and the fuel value of food and by the maxim that the true principles of dieting in disease must be in accordance with the dictates of common sense.

Nature's indications as regards diet relate to appetite and the sense of taste as regulated by individual experience. Natural craving for a certain food is not necessarily morbid in disease and should not, as a rule, be opposed. To the healthy person the natural demands of the appetite are the best guide for quantity and quality, and a mixed animal and vegetable food is the best diet.

In disease instinct may fail to express the proper needs of the system, and the knowledge and judgment of the physician will be called for.

The exigences of life have established the routine of three meals a day, but in many cases dyspeptics of sedentary habits might with profit go back to nature and eat only when they had the desire for food.

REMARKS ON DIGESTIBILITY OF FOOD

Beef possesses great nutritive power and furnishes the most palatable and appetizing broth. Salted meat is less nutritious than fresh, because the brine extracts from the muscular tissue some of its nutritive principles. Next to beef in nutritive value come *mutton* and *venison*, then the flesh of *fowls*, the various kinds of *game* birds, and lastly *fish*. The difference between white meat and dark meat as regards digestibility is too trivial to be of practical importance. *Fish* is slightly nutritive, but easily digestible. Its exclusive use would produce a diminution of the muscular force, paleness of the tissues, and all the signs of subalimentation. The flesh of *shell fish* is hard of digestion. *Roast* meat is more digestible than *boiled* meat. *Eggs* very slightly cooked are more digestible than white meats. Of *vegetables*, the succulents are the most digestible. *New bread* is heavier than stale bread. The aliments to which the cook's art gives a liquid or semiliquid form are, in general, more digestible than others. Both reason and experience show that Nature's liquid and semiliquid foods, milk and eggs, are particularly adapted for a feeble digestion during the course of febrile disease. Of the vegetable class, *lentils*, *beans*, and *peas* are the most nourishing. *Fruit*, when perfectly ripe, is easy of digestion, because the juice of fruit consists of pure grape sugar (glucose) and water, and it is in the form of grape sugar that all starchy food is finally absorbed into the system.

THE ABSORPTION OF FOOD

Although we possess considerable knowledge regarding the absorption of food and the quantities necessary to sustain life, our knowledge of the ultimate processes of assimilation and dissimilation is meagre. The animal organization requires constant feeding with water, salts, and organic materials —proteids, carbohydrates, and fats. The proteids are tissue builders. The carbohydrates are energy producers. Without proteid material in some form life cannot be sustained. The amount necessary depends upon individual disposition and upon individual expenditure of heat and force. An inadequate supply of food from loss of appetite or poverty leads to inanition; and, if the animal organism does not get the adequate amount of food, it burns its own material. Thus some parts of the organism are sacrificed to preserve the whole. The first to be used up are the fat and sugar (glycogen), and finally the albuminoids, or living tissue. Fat and muscle go first, and subsequently skin, liver, bone, heart, and central nervous tissue. The surplus of nitrogenous (proteid) material absorbed by the gastroenteric tract leaves the body through the kidney (urea). Thus it is not possible to increase living tissue by simply overfeeding with proteids.

The carbohydrates furnish the living energy of the body. A surplus of such foods is lost partly through an overproduction of heat, but is principally hoarded in the body as fat and glycogen unless oxidized and thrown off by exertion. It is suspected that a large quantity of water favors an increase of fat, but this is by no means established as a fact.

It is difficult to establish a line of demarcation between normal and pathological adiposity, and clinically we speak of the latter in connection with certain subjective complaints, such as dyspnœa, sweating, a feeling of weakness, heart palpitation, and general anæmia. Alcohol in all forms (but particularly as beer and whiskey) is easily burnt up, prevents fat oxidation, and produces a habit of indolence. Thus for simple forms of fat deposit a regulation of diet and exercise is sufficient. But some people do not get fat by overeating, and others do not get lean by undereating. There must be some factor influencing metabolism outside of a lack of harmony between the quantity of food and the energy expended (perhaps suboxidation). An undue loss of proteids and fats is observed in fever, carcinosis, tuberculosis, anæmia, pneumonia, and acute dyspnœa, probably due to the formation of toxic products in such diseased conditions. The thyreoid gland increases fat and proteid metabolism.

A healthy organism will thrive on plain food and assimilate the nutrient qualities of the crudest material. A feeble digestion will require concentrated and easily digested food. A thorough knowledge of the chemistry of digestion and assimilation is valuable, but its practical application is limited, owing to the great complexity of the subject. The gastroenteric tract must not be likened to a test tube with a final and definite chemical reaction of its contents. Nature has the power of vicarious selection, and seeks her nutritional elements from all sources.

The Components of Food

Perishable, or organic, food may be divided into **nitrogenous** and **non-nitrogenous.**

1. We have (a) *albuminates* and *gelatinous* substances from the animal and (b) *gluten* and *legumin* from the plant.

2. We have (a) *hydrocarbons*, as *fats*, *oils*, *butter*, etc., and (b) *carbohydrates*, as *starch*, *sugar*, and *vegetable acids*.

The final product of albumin in the gastroenteric tract is peptone. The transitional stages of albumin digestion by means of pepsin, hydrochloric acid, and pancreatic juices are designated acid albumin, hemialbumin, and peptones. Peptone, after reabsorption, plays its rôle as a tissue builder by the synthetic process.

The fats are slightly changed in the stomach, but the principal assault upon fat takes place in the intestines by means of pancreatic juice, bile, and bacteria, and the final products are triglycerides, fatty acids, and neutral soaps.

Absorption of fat and its components takes place in the intestines through epithelia, and then fat is deposited in various parts of the body.

The Carbohydrates.—The sugars taken into the gastroenteric tract are in a state ready for absorption. Starchy food must be turned into absorbable sugar by means of dextrose, which is found in the saliva and pancreas. Then starch is converted into dextrin, maltose, and grape sugar, and what is not destroyed by fermentation in the gastroenteric tract is absorbed into the portal circulation. The inorganic constituents of food are the various salts and water. To summarize, we may say: Milk, eggs, meat, fowl, and fish are rich in albumin. Bread, cereals, potatoes, beans, and peas contain starch and albumin. Fruits, spinach, lettuce, tomatoes, celery, etc., supply vegetable acids, salts, sugar, etc.

The Fuel Value of Food.—Heat and muscular power are forms of force and energy. The energy is developed as the food is consumed in the body. The unit of measurement is the *calorie*, this being the amount of heat which will raise the temperature of a pound of water 4° F. (1 kilo of water 1° C.).

1 gramme of protein – 4 calories.	1 lb. of protein – 1,860 calories.
1 gramme of starch or sugar – 4 calories.	1 lb. of starch or sugar – 1,860 calories.
1 gramme of fat – 9 calories.	1 lb. of fat – 4,220 calories.

A man at rest requires about forty calories per kilo, of body weight. A man weighing sixty kilos requires two thousand calories in twenty-four hours. Thus, in twenty-four hours, a man requires:

Albumin,	50 grms. =	200 calories.
Fat,	50 " =	450 "
Starch or sugar,	400–500 " =	1,600 "
Total		2,250 "

The approximate requirement for a growing child is not found by multiplying its weight in kilos by forty (calories). During the first year of its life a child which is thriving gains half an ounce a day and requires on an average a quart of milk. One quart of milk represents seven hundred calories. In the healthy individual the normal requirements of food or heat energy will depend upon the amount of expenditure in motor force, mental force, and sexual (reproductive) force.

CALORIES, OR HEAT UNITS, REQUIRED IN FOOD PER DAY

(*Compiled by Atwater*)

Children, to one and a half years,	767 calories.
" two to six years,	1,418 "
" six to fifteen years,	2,041 "
An aged woman,	1,860 "
An aged man,	2,477 "
A woman at moderate work or light exercise,	2,400 "
A man at moderate work or light exercise,	3,000 "
A man at hard labor,	3,500 "

One day solid food rations (Mrs. E. H. Richards):

Bread,	16 oz.	1,200 calories.
Meat,	8 "	243 "
Oysters,	8 "	70 "
Cocoa,	1 "	135 "
Milk,	4 "	75 "
Broth,	16 "	613 "
Sugar,	1 "	112 "
Butter,	½ "	118 "
		2,572 "

Heat Values and Food Values.—According to Armsby the food value of a nutrient as a source of energy to the organism is not measured by the total energy which it can liberate as heat in the body, but by the part of this energy which is available to the organism for physiological uses. The remainder of the fuel value simply serves to increase the generation of heat in the body, a result which may be advantageous or the reverse, according to the surrounding conditions.

ATKINSON'S TABLE OF NUTRIENTS AND CALORIES OF DIFFERENT PEOPLE

	Proteids. Grms.	Fats.	CH.	Total.	Calories.
Sewing girl, London. Wages, 93 cents a week	53	33	316	402	1,820
Factory girl, Leipsic, Germany. Wages, $1.21 a week	52	53	301	406	1,940
Poor laborer, Lombardy, Italy. Mostly vegetable diet	82	40	362	404	2,192
Trappist monk in cloister. Little exercise. Vegetable diet	68	11	469	548	2,304
German miner. Severe work	133	113	634	880	4,195
Brickmaker, Italian, at contract work, Munich	187	117	675	959	4,641
Brewery laborer, Munich. Severe work. Exceptional diet	223	113	909	1,245	5,692
German soldier, peace footing	114	49	480	633	2,798
German soldier, war footing	134	58	489	681	3,093
German soldier, extraordinary exertion. Franco-Prussian War	157	285	331	773	4,652
Factory operator, Massachusetts	127	186	531	844	4,428
Private well to do family:					
Food purchased	129	183	467	779	4,146
Food eaten	128	177	466	771	4,082
Eastern States:					
College students boarding	138	184	622	944	4,827
College football team	181	292	557	1,030	5,742
Clubs:					
Food purchased	115	163	480	738	3,874
Food eaten	104	136	421	661	3,417
Teamster with hard work, Boston	254	363	826	1,443	7,804
Brickmaker, Massachusetts	180	365	1,150	1,695	8,848
U. S. Army ration	120	161	454	735	3,851
U. S. Navy ration	143	184	520	847	4,998

As a matter of practical interest, the following calorie tables are reproduced (Woodruff, Garrison Rations):

FORCE PRODUCING VALUE, OR CALORIES PER POUND

Bacon, fat, or lard,	3,080	calories	per lb.
Beans,	1,615	"	"
Salt pork, fat,	3,510	"	"
Sugar,	1,820	"	"
Flour,	1,644	"	"
Beef,	1,460	"	"
Potatoes, raw,	375	"	"
Onions,	225	"	"
Oatmeal,	1,850	"	"
Corn meal,	1,645	"	"
Tapioca or cornstarch,	1,820	"	"

Dried apples,	1,418	calories	per lb.
Butter,	3,615	"	"
Syrup,	1,023	"	"
Rice,	1,630	"	"
Canned corn,	345	"	"
Canned tomatoes,	80	"	"
Macaroni,	1,406	"	"
Milk, fresh,	418	"	"
Condensed milk,	1,595	"	"
Peas,	1,565	"	"
Raisins,	440	"	"
Cheese,	1,620	"	"
Prunes,	140	"	"
Cabbage,	155	"	"
Ham,	1,950	"	"
Canned apricots,	460	"	"
Barley,	1,820	"	"
Chocolate,	2,650	"	"
Sausage,	2,065	"	"
Oysters,	230	"	"
Canned salmon,	965	"	"
Crabs,	526	"	"
Crackers,	1,920	"	"

For the convenience of the general practitioner, the writer herewith furnishes a list of calories compiled from many sources which may be of aid in selecting a rational dietary for patients and in estimating the caloric value of food taken or prescribed:

			Calories.
1		egg,	80
1		quart of milk,	675
100	grammes of	milk,	60
100	"	skimmed milk,	40
100	"	cream,	220
100	"	buttermilk,	40
100	"	ham,	400
100	"	ham and eggs,	250
100	"	wheat bread (toast),	260
100	"	zwieback,	360
100	"	sweet rice cake,	420
100	"	plain cake,	375
100	"	butter,	800
100	"	beef (raw),	120
100	"	" (roast or stewed),	220
100	"	veal cutlets,	230
100	"	" " (raw weight),	140
100	"	chicken (raw weight),	106
100	"	squab (" "),	100
100	"	calves' brains,	140
100	"	fish (raw weight),	100
100	"	oysters (raw weight),	20
100	"	rice, boiled in milk,	175
100	"	mashed potatoes with butter,	127
100	"	spinach (rich),	165
100	"	purée of beans,	190
100	"	fresh beans,	40

			Calories.
100	grammes	of asparagus,	20
100	"	farina,	290
100	"	omelette,	240
100	"	maccaroni,	350
100	"	caviar,	133
100	"	fruit jelly,	90

Physiological economy in nutrition, according to Professor R. H. Chittenden, means temperance and not prohibition and full freedom of choice in the selection of food. Food requirements vary with changing conditions, and the requirements of proteid food are about one half of the amount generally consumed. Excess means not alone waste, but unnecessary strain and waste of energy to get rid of the excess. Bodily equilibrium requires less than 3,000 calories a day under ordinary circumstances, with only 16 to 18 grammes of nitrogen a day in the form of proteid.

PRACTICAL DIETETICS

Dieting is the systematic regulation of diet for hygienic or therapeutic purposes. For all practical purposes the various forms of diet will admit of a simple classification, viz.: 1. A *liquid diet* for acute febrile disease; 2. A *light diet* for convalescence in febrile disease; 3. A *restricted diet* for subacute and chronic indigestion and malnutrition from whatsoever cause; 4. A *special diet*, as for gout, diabetes, children, etc.

Fluid Diet.—Selections may be made from the following lists:

WATER.—Cold, hot, aërated, flavored, toast water, sugar water, soda water.

SOUPS.—With or without egg or cereals, etc., burnt flour soup (excellent in diarrhœas), slimy soup of oatmeal or barley with and without egg, may be seasoned with celery salt. Bouillon, beef tea, meat juice, clam broth, oyster juice, mutton broth, and chicken broth have low nutritional value unless they contain cereals, rice, barley, sago, or eggs.

GRUELS.—Arrowroot, barley, cracker, diabetic, farina, Indian meal, oatmeal, rice, rice creamed, gruels dextrinized, gruels peptonized.

MILK.—Raw, plain, with salt, with lime water, with Vichy, sterilized, Pasteurized, peptonized, buttermilk, kumyss, matzoon, kefir, whey, eggnog, white of egg in water, milk punch, malted milk.

Milk Cure.—An exclusive diet of milk or diluted milk may be desirable in the following conditions or diseases: In infancy for the first eight months; in typhoid fever in the absence of tympanites; in acute and sometimes in chronic Bright's disease; in acute pyelitis; in chronic gastric catarrh; in gastric ulcer and carcinoma; in neurasthenia; in scarlatina; in the Weir Mitchell rest cure.

Other articles of fluid diet are gum arabic solution (in water), chocolate, cocoa, digestible cocoa, ice cream, water ices, Roman punch, scraped ice, orange juice, pineapple juice, unfermented grape juice, non-alcoholic malt liquors, liquid peptonoids.

Light, or soft, diet (convalescent diet) embraces *liquid diet plus* meat, jelly, and calves' foot jelly; eggs, scrambled, soft boiled, poached, raw; scraped meat or beef; oysters, raw, stewed; tomato ketchup; green salads, with vinegar or lemon juice dressing; lettuce; watercresses; asparagus tips; crackers; toast; zwieback; Albert biscuits; sponge cake; Graham crackers; saltines; bread (not fresh); rolls; puddings: rice, farina, cornstarch, tapioca, custard; *purées and bisques:* asparagus, bean, celery, chicken, clam, onion, oyster, pea, tomato; *jellies:* beef aspic, chicken aspic, calves' foot, orange, sherry, champagne, lemon, wine, cranberry; stewed fruit; stewed prunes, baked apples, apple sauce; oranges, grape fruit; stewed tomatoes, spinach, rhubarb; preserves, currant jelly, fruit jelly; Charlotte russe, blanc mange; oyster cocktail, egg soufflé; chocolate in cakes; ham (raw), tongue, ham and egg omelette; calves' brains, sweetbreads; mock turtle soup; macaroni with tomato sauce; anchovy paste or caviar on toast; malt preparations.

Full diet with certain restrictions embraces *soft* and *liquid diet plus* boiled fish, beef, mutton, and lamb stews, pot roast, broiled chicken, turkey, squab, venison, partridge, quail, tongue, hash, pickles (salt), corned beef, cauliflower, beets, asparagus, celery, potato salad, potatoes boiled in "jackets" and creamed, salt sardelles, anchovies, soused mackerel, creamed codfish, omelette, salmon, herring and herring salad, fillet of beef, cold meats, beefsteak, veal cutlets, capon, meat balls, meat dumplings with sardelle dressing, cheese (Roquefort, cream, imperial, Camembert); *sandwiches:* celery, lettuce, water cress, chicken, scraped beef, club, raw Westphalian ham, caviar, salt sardelles, *with special restrictions when called for.*

Fever Diet for Adults and Older Children.—Beef broth and egg, mutton broth and egg, sago, eggnog, white of egg in water, soups, gruels, milk, malted milk, matzoon, kumyss, cocoa, tropon in peppermint tea, ice cream, water ices, custard, orange and pineapple juice, beef jelly, ginger ale.

To these may be added in the convalescent stage: Apple sauce, baked apple, sponge cake, biscuits, rice, farina, bread pudding, cereals, scraped meat, scrambled eggs, or calves' foot jelly.

Alcohol in the shape of whiskey, champagne, or Tokay wine is sometimes of great value as a food and stimulant. Other articles may be selected from the list of liquid and soft diet.

Fever diet for breast and bottle babies is discussed in the chapter on General Therapeutics and in that on Pædiatrics.

Stimulants and Beverages

Alcoholic Drinks.—Alcohol as a beverage is unnecessary in young and healthy individuals. Persons in danger of the alcohol habit by inheritance should shun it. The abuse of alcoholic stimulation is invariably injurious. The temporary use of alcohol in certain diseases, in septic fevers in adults and in children, is of value and may become necessary to prolong life in connection with other stimulants. Given under the proper conditions and in proper amount, alcohol is capable of stimulating respiration, circulation, and digestion, and to a certain degree also of serving the purposes of a food and of supplying a certain amount of heat. It is particularly useful in senile loss of appetite.

Malt Liquors.—Nutritious non-alcoholic malt liquors are obtainable under various names in the shops.

Beer contains bitter extract, sugar, and from 3 to 8 per cent of alcohol.

Ale, porter, and barley wine contain from 3 to 7 per cent of alcohol. Beer, ale, and porter are sometimes useful in insomnia.

Wines.—White, Rhine, and Moselle contain from 9 to 12 per cent of alcohol. Convalescents may require a glass of light wine with a meal.

Red wines contain from 9 to 10 per cent of alcohol and ⅛ per cent of tannin. Wines contain sugar, alcohol, and organic acids. French, Hungarian, and Rhine or Moselle wines may be taken after a meal in anorexia. Excellent American wines are now obtainable for half the price of the imported.

Heavy Wines.—Sherry, Port, Madeira, Tokay, and Malaga are sweet wines.

Aromatic Wines.—Bordeaux, Burgundy.

Sparkling, or champagnes, contain from 12 to 14 per cent of alcohol. They are serviceable in prostration and collapse with vomiting.

Non-alcoholic Drinks.—Tea, green and black, coffee. Stimulating to the nervous system. If tea and coffee produce nervousness, substitute cereal coffee, postum coffee, malt coffee. Cocoa, chocolate, kola cocoa (digestible cocoa is slightly stimulating and decidedly nutritious). Pure water, lemonade made with lime juice or lemon juice, ginger ale, peppermint tea, toast water, soda water will quench thirst. Hot water will often quench thirst better than ice water. Sucking a prune will also quench thirst. Milk is a drink and a food at the same time, and, on account of its importance, will be discussed in a separate chapter (Facts about Milk).

Mineral Waters.—Mineral waters may be divided into six principal groups:

1. Still and Sparkling Alkaline Waters.—Vichy, Rhenser, Apollinaris, Salzbrunn, Vals, Ems, Neuenahr, Fachingen, etc. *Indications:* Gout, acid dyspepsia, chronic gastrointestinal catarrh, gravel, cystitis, hepatic congestion.

2. Sulphur Waters, Cold and Hot.—Baden in Switzerland; Aix les Bains, St. Honoré, France; Neuendorf, Weilbach, Germany; Harrowgate, England; White Sulphur Springs, Ohio; Richfield Springs, Sharon Springs, New York; White and Red Sulphur Springs, Virginia; Banft, Canada; Glenwood Springs, Colorado. *Indications:* Chronic articular, cutaneous, respiratory, and gouty ailments.

3. Saline Waters.—Saratoga waters, New York; Middlewich, Leamington, Cheltenham, England; Kissingen, Homburg (cold and warm), Pyrmont, Kreuznach, Wiesbaden, Baden Baden (hot salt), Reichenhall, Nauheim (gaseous salt), Germany. *Indications:* Gastric, circulatory, and respiratory disturbances.

4. Indifferent Waters.—Wildbad, Gastein, Ragatz; Schlangenbad, Badenweiler.

5. Chalybeate Waters.—Schwalbach, Spa, Saratoga. *Indications:* Anæmic conditions.

6. Laxative Waters.—Carlsbad, Marienbad, Tarasp, Saratoga laxative waters. *Indications:* Hepatic and gastrointestinal disorders, obesity.

They are valuable in a measure in the management of divers troubles, but the wonderful cures which they are supposed to effect are due to a combination of diet, exercise, and freedom from business and other worry, particularly in those instances in which the sufferer or alleged sufferer goes abroad and distance lends enchantment to the scene.

Predigested Food

Pancreatized food is sometimes serviceable when the digestive power is feeble, but is frequently ordered unnecessarily and in cases in which it is harmful. It is prepared by means of pepsin and hydrochloric acid or with extract of pancreas. The extract of pancreas is prepared by macerating for one week the pancreas of a pig, calf, or sheep with four times its weight of 50 per cent alcohol, and filtering. Peptonized food does not keep well and must be prepared several times a day. Beef or sarcopeptones are obtainable in the shops in a liquid or semisolid form, and can be made fresh by treatment of beef with the above mentioned extract of pancreas.

Peptonized beef tea is made by adding ten grains of bicarbonate of sodium to a pound of lean beef and one pint of water. Allow to simmer for an hour. Mash the undissolved meat to a pulp, add a teaspoonful of extract of pancreas to the beef tea and pulp, and keep warm for two hours. Then boil for three minutes, strain, and season with salt or celery salt.

Pancreatized milk is readily prepared by means of peptogenic powder, which is obtainable in the shops (see Facts about Milk). It comes in glass tubes with full directions on each. It may be given to children in malnutrition and feebleness of digestion during acute and subacute illness, but is only a temporary makeshift, as its prolonged use will result in a putrid condition of the gastroenteric tract.

Concentrated Foods

In malnutrition and feeble digestion the administration of concentrated food may be necessary.

Beef meal is said to contain 77 per cent of proteids and 13 per cent of fat. It is tasteless and odorless.

Soluble beef jelly is said to contain 50 per cent of proteids. It has a pleasant taste and odor, is nutritious, and may be added to consommé, broth, and gruel.

Soluble beef and *vigoral* are said to contain from 50 to 60 per cent of proteids. They are very nutritious and palatable.

Extract of beef, meat juice, and *beef tea* have little food value, but are slightly stimulating. A raw egg beaten up with beef tea will greatly enhance its value.

Tropon, somatose, and *plasmon* are concentrated vegetable proteids. Tropon is not soluble in water, but can be taken in soup, tea, cocoa, or mush, also combined with iron (iron tropon). *Somatose* is soluble in water and can be used for nutrient enemas in wasting disease, etc. *Condensed milk* and *evaporated cream* rightly belong to the class of concentrated foods, but are discussed in the chapter on Milk.

Systems of Diet

Banting and Ebstein Systems.—These systems of diet may be compared as follows:

	Proteids.	Fat.	Carbo-hydrates.	Total in 24 hrs.	Calories.
BANTING,............	Grammes, 171	8	75	254	1,085
EBSTEIN,............	" 102	85	47	234	1,400

In the *Banting* system starch, sugar, and fluids are forbidden. The bulk is made up by fruit and vegetables. In the *Ebstein* system fat is allowed, and this diminishes the appetite and craving for food. Sugar and starch are forbidden except three and a half ounces. Fluids are restricted.

BREAKFAST.—Cup of tea without sugar or milk, bread or toast with two oz. of butter.

DINNER.—Soup, 4 to 6 oz. of meat, vegetables, salad, fruit, and black tea.

SUPPER.—Tea, egg, fish, ham, cold meat, buttered toast, fruit.

Oertel and Schwenninger System:

	Proteids.	Fat.	Carbo-hydrates.
1. Maximum allowance, grammes,..................	150	50	200
2. " " "	250	25	100

and withhold fluids. No fluids at meals. Climbing of graded paths, massage, baths.

In the foregoing table No. 1 is for cases where there is fat accumulation without much respiratory and circulatory disturbance; and No. 2 where there is fat accumulation with respiratory and circulatory disturbance.

The caloric value of twenty-four hours' food in Banting's system is about 1,100; in Ebstein's, about 1,400; in Oertel and Schwenninger's, about 2,000.

Weir Mitchell System.—Rest, passive exercise, massage twice a day, and Swedish movements. Skim milk diet, gradually introduced until patient lives entirely on milk. Vary the monotony with beef, chicken, and oyster soup. In six weeks' time fat is reduced.

Diet for Leanness.—First ascertain the cause. Give sugars and starch. Freedom from mental strain. Abundant sleep and rest.

Diet for Obesity.—In a diet for *obesity* it is practically unimportant what is given, so long as the nutritive value is calculated. From a study of the food values as shown in the preceding pages, the actual value of the various diet systems will readily be understood; and this will enable the practitioner to intelligently regulate the diet of any individual case in which he may be interested.

VEGETARIANISM

From a study of the following menu[1] it will be seen that the dietary is made up of a proper variety of proteids, carbohydrates, and fats, and is calculated to exert a favorable influence on overfed individuals. The beneficial effects of vegetarianism do not depend upon the fact of its followers not taking animal food, but on their giving up former bad habits.

A VEGETARIAN MENU

DINNER

SOUPS

Cream of Peas Fruit

ENTRÉES

Broiled Nuttolene—Tomato Sauce
Sliced Savory Protoso
Nut Roast with Potatoes

RELISHES AND SALADS

Celery Apple and Banana

VEGETABLES

Sliced Tomatoes Stewed Navy Beans
Green Corn Potatoes

DEXTRINIZED GRAINS

Toasted Whole-wheat Wafers
Granose Flakes Granola Porridge
Granut Zwieback Roasted Rice
Browned Granose Biscuits
Granola Dry Gluten
Toasted Wheat Flakes

CEREALS

Farinose—Grape Sauce
Granola Porridge—Raisins

LIQUID FOODS AND BEVERAGES

Vegetable Broth Caramel-Cereal
Gluten Gruel Grape Gruel Dairy Cream
Sterilized Dairy Milk Almond Cream

FERMENTED BREADS

Coarse Graham Bread Fine Graham Bread
White Bread

UNFERMENTED BREADS

Beaten Biscuits
Graham Crackers Passover Bread
Crisps

COOKED FRUITS

Prunes Peaches Strawberries

FRESH FRUITS

Plums Peaches Cantaloupe

DESSERTS

Shelled Walnuts Bread Pudding

ARTICLES SERVED TO ORDER

Carbon Crackers Gluten Biscuit No. 1
Gluten Wafers Dyspeptic Wafers
Popped Corn
Vegetable Bouillon
Junket Buttermilk Kumyss Kumyzoon
Milk with Lime Water
Tomato Sauce Stewed Tomatoes
Corn Pulp Granose Balls Protose Patties
Floated Eggs Eggnog
Green Peas Bean Purée Pease Purée
Milk Custard Prune Marmalade

MALTED FOODS

Malt Honey Maltol Malted Nuts
Sanitas Food Bromose

EXERCISE AND DIGESTION

Children's digestion suffers but little by active romping after a meal. Adults do not respond favorably to violent exercise after eating. Muscular fatigue and overexertion immediately before eating are not desirable. Dyspeptics should lie down for half an hour before eating. Aged people can take a short rest of half an hour after dinner. After eating a heavy meal, one should wait two hours before going to bed.

Hunger produces wakefulness. Take crackers, beer, milk, and toddy.

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[1] Battle Creek Sanitarium.

In old age the circulatory and nervous systems are less active, the digestive power is less vigorous, and there is not so much demand for fuel in the body. Diminish the total quantity of food, give food in small amounts at frequent intervals, give easily digestible food, and live moderately and thereby prolong life.

TOBACCO, FOOD, AND DIGESTION

No definite rules can be formulated for the use of tobacco in relation to meals. Persons who are not made nervous or irritable by smoking after eating may do so if they enjoy it. Mild tobacco favors peristalsis and sometimes overcomes fatigue. Smoking before meals often destroys the appetite and interferes with digestion. Tobacco in its relation to diseased conditions will be discussed under various headings.

Rectal alimentation and *feeding by tube* are discussed in the chapter on General Therapeutics.

CHAPTER V

THE DIGESTIVE SYSTEM—*Continued*

DISEASES OF THE MOUTH

SYNOPSIS: **General Remarks.—Slobbering.—Dryness of Mouth.—Gingivitis.—Bleeding and Spongy Gums.—Stomatitis (all forms).—Noma.—Urticaria of Mouth.—Actinomycosis.—Foul Tongue and Breath.—Glossitis.—Benign and Malignant Ulceration of Tongue.—Herpes of the Tongue.—Swollen Papillæ.—Cyst and Concrements.—Ranula.—Herpes.—Eczema.—Fissures of the Lips.—Care of the Teeth.—Emergency Treatment of Toothache.**

GENERAL REMARKS

A CLEAN mouth is one of the best prophylactics against disease, and is consequently of very great importance to the individual. The mouth is not only frequently the seat of purely local disease, but is prominently a favorable portal of entrance for microbial and putrid products which are known to be factors in the production of most profound constitutional disturbances.

It will readily be understood that in persons afflicted with chronic ailments in most instances the mucous membranes have *lost their integrity in consequence of malnutrition*, and consequently offer but *slight resistance to microbial invasion*. Thus are explained the many and often fatal complications arising in the course of subacute and chronic disease. In the course of acute infectious fevers less saliva is secreted, the mouth becomes dry and hot, and in this manner local infection and invasion are favored. Patients suffering from stomatitis or putrid mouth swallow much septic material and readily infect the gastroenteric tract. Certain forms of **stomatitis** should be looked upon as eliminative phenomena[1] in which the bacterial character of the lesions plays a secondary rôle, in which local treatment of the mucous membrane must be combined with the best hygienic management in order to get satisfactory results. As a prophylactic measure, kissing of children on the mouth must be forbidden, as this habit obviously enough is a prolific means of disseminating infectious and contagious disease. Carious teeth must be extracted or filled. In the case of children with temporary teeth a cement filling may be inserted. Children and grown persons should seek to live in the best possible hygienic surroundings and sleep in cool rooms with windows open, encouraging constant ventilation. Sunshine, fresh air, and plain, nourishing food are the best medicaments, regarded from the standpoint of prophylaxis, and mouth washes and gargles are of great value.

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[1] Elimination as an Ætiological Factor of Diseases of the Alimentary Canal. By Dr. F. Forchheimer, of Cincinnati (*Transactions of the American Pæd. Soc.*, 1896).

Regarding the classification of disorders of the mouth it may be stated that attempts have been made at nomenclature based on the microbes found in various inflammatory diseases of the mouth. For practical purposes, we may consider in this chapter the clinical forms met with in practice, from the simple inflammatory type to those of more severe and destructive nature. For diseases peculiar to infancy and childhood, see Pædiatrics.

DISEASES OF THE MOUTH

Slobbering.—This manifestation, which is aptly enough described by the name accorded it, is not of infrequent occurrence in early infancy and during the period of dentition. Though frequently ascribed to local irritation, difficult dentition, and uncleanliness, it is not necessarily so caused; and presents no special pathological features. In adults it is often associated with other depraved habits, also in idiots, epileptics, and those morally and physically degenerate.

Dryness of the Mouth; Arrest of Salivary and Buccal Secretion (Xerostomia).—This condition is often annoying and of sufficient clinical significance to call for treatment. Glycerin and rose water, equal parts, used as a mouth wash, will alleviate the trouble. When it occurs in febrile disease and in mumps water should be copiously administered.

Gingivitis.—This acute inflammatory condition of the gums is occasioned by the presence of decayed teeth, retained, decomposing secretions, or local infection. In impaired general health and lowered vitality the gums are quite apt to take on this inflammatory disorder. The gums are painful and injected and bleed readily, and the *treatment* must be directed to removing the local cause (*e. g.*, decayed teeth must be filled or extracted). Astringent mouth washes will accomplish much to allay and cure the affection. Tincture of myrrh and tincture of rhatany, equal parts, applied with a cotton pledget along the affected gum area, are very efficacious. Tannate of glycerin in water as a mouth wash, and chlorate of potassium administered internally and used as a wash, are most efficacious remedies. Permanganate of potassium in water (rose colored solution), used frequently as a gargle, will accomplish much in the way of cleansing the mouth of decomposing material by its oxidizing power.

Bleeding of the Gums, Spongy Gums, Discoloration of the Gums.—Independent of the acute inflammatory affections of the gums, bleeding is observed in persons of feeble health and as a prominent symptom of scurvy, the slightest touch frequently being sufficient to provoke bleeding. When the bleeding does not respond to the simple methods, prolonged pressure over the part with pledgets of cotton saturated with alum solution or persulphate of iron may favor cessation of the bleeding. Antipyrin in 10 per cent watery solution, applied locally, also has hæmostatic properties and may be of service. Suprarenal preparations in solution will in many instances prove very efficacious. Means adapted to the improvement of the general health must be employed in addition. When the sponginess and bleeding may be attributed to the abuse or prolonged use of mercurials (red line gums) and lead preparations (plumbism, blue line gums), the administration of these drugs must *pro tempore* be discontinued. The treatment of hæmorrhagic gums in scurvy is described under Scurvy.

Stomatitis Catarrhalis (Simple or Erythematous).—This form of inflammation is usually of mild type, runs an acute course, terminating in about a week, and is associated with no pronounced constitutional disturbances. It is generally observed during infancy and is caused by the introduction of irritating and unclean substances into the mouth (e. g., dirty fingers, unclean nipples). It may be concomitant with or secondary to the exanthemata and gastrointestinal affections.

The SYMPTOMS are mild; there is some rise in temperature, and the mouth at first is red, dry, and hot. Thirst, pain, and irritability are present; later the mouth becomes moist and there is increased salivation. The changes in the mucous membrane consist simply of local hyperæmia, increased epithelial proliferation, and subsequent desquamation with little or no tendency to ulceration.

The TREATMENT of this affection consists in keeping the mouth clean. Care is to be taken that the nipples and fingers are rendered clean before being introduced into the mouth. The mouth may be cleansed with sterile water or mild boric acid solution (2 per cent) or a mild solution of borax in water and glycerine. Should constipation exist, a mild laxative may be exhibited.

Stomatitis Follicularis (Aphthous or Vesicular Form).—This is of severer type and longer duration than the simple catarrhal form. The local tissue changes are more marked and the constitutional disturbance more pronounced. Causative agents are any of the severer constitutional diseases, a deteriorated state of health, malnutrition, and unhygienic conditions and surroundings. The changes observed in the mucous membrane consist in the appearance of vesicles which ulcerate and have shallow, well defined grayish yellow denuded surfaces which later heal. The affection is in many instances so painful that the child refuses nourishment.

TREATMENT.—A pale rose colored solution of permanganate of potassium is an efficacious mouth wash. It is best applied by swabbing the mouth frequently with cotton pledgets moistened with the solution. Boric acid, six parts, salicylic acid, one part, water, five hundred parts, make an excellent wash. Among other agents which may be employed are alum water (a teaspoonful to half a pint) or tannic acid (one drachm, glycerine, one ounce), thirty drops to a wineglassful of water, also Labarraque's solution, in water of the strength of one in twenty.

Stomatitis Ulcerosa.—In this form destructive tissue changes are still more marked than in the foregoing affections. Tissues adjacent to the ulcerated areas are hard and infiltrated. The gums are chiefly the seat of the ulcerating process, and there is much puffiness and swelling and bleeding of the affected gums. There is, moreover, a decided fœtid odor from the mouth. Besides local infection or putrid decomposition, scorbutus, salivation induced by mercury (ptyalism), and malnutrition are causative agents. Children suffering from ulcerative stomatitis are decidedly sick, particularly the debilitated and cachectic from prolonged illness. In protracted cases, too, glandular swelling follows the local absorption of decomposed material and frequently terminates in suppuration.

TREATMENT.— Fresh air, nutritious food, and attention to hygiene are important essentials. Constitutional diseases acting as causative factors will call for treatment. For local use, a 2 per cent solution of potassium chlorate in a wineglassful of water, to which thirty drops of tincture of myrrh and thirty drops of compound spirit of lavender may be added, will be found beneficial. Dilute hydrochloric acid, gtt. 2 to 5 in sugar water, may be administered internally to aid digestion. Two per cent boric acid solution, to one pint of which may be added thirty drops each of formalin and spirit of wintergreen, is a useful mouth wash. Weak solutions of peroxide of hydrogen or alum, a teaspoonful to half a pint of water, are also serviceable.

For bleeding gums a saturated alum solution, suprarenal capsule solution, or 10 per cent antipyrine solution, locally applied, will frequently prove very effective and has given satisfactory results even in the case of bleeders. Still, instances will occur where one will be compelled to resort to the actual cautery (Paquelin) to check the bleeding. There are also graver cases. For example, in diabetes, nephritis, and chronic hepatitis with jaundice, patients may bleed from the gums for days; and moribund patients may bleed even up to the time of death, notwithstanding the best of attention and efforts to check the bleeding.

Stomatitis Gangrænosa (Noma, Cancrum Oris), is of rare occurrence and is characterized by a rapid gangrenous destruction of tissue involving the neighboring structures of the mouth. It is probably of microbic origin. Debilitating disease and bad hygienic conditions presumably act as predisposing factors. The affection is at first local, appearing as a small inflamed spot, rapidly becoming gangrenous, spreading, and involving the surrounding tissue. This destructive process, if left unchecked, attacks the bony structures in its vicinity, involving the cheek and whole side of the face. It is unlimited in its destructive progress, and unless it is checked sufficiently early, death ensues as a result of general sepsis, the lungs, heart, liver, and kidneys showing post mortem evidences of profound degenerative changes.

The indications for TREATMENT are to check, if possible, the advance of the destructive process, to prevent absorption and general systemic infection, and, further, to maintain the strength of the patient. Locally, antiseptic solutions are to be frequently and diligently employed. The actual cautery and strong escharotics must be used to remove sloughs and destroy the virulent process at its seat. When, however, the sloughing area is extensive, a radical resort to the knife is preferable, and the resulting deformity may later be corrected to a degree by a plastic operation. To sustain nutrition, the patient should receive strengthening food stuffs, beef broth, milk, eggs, farina, and rice; and, in addition, some tonic may be administered. Severe cases of noma have been favorably influenced by diphtheria antitoxine.

Complicating pneumonia, gastrointestinal catarrh, nephritis, or sepsis will require special treatment directed to minimize the intensity of the poisonous invasion and to support general nutrition. Kissjel's treatment of noma is said to give excellent results. This procedure consists of the following steps: The gangrenous tissues are completely removed; the affected surface is scraped with a sharp spoon and washed with hot solution of boric acid or permanganate of potassium. The ulcer is then thoroughly rubbed with iodoform, and a dry dressing is applied. If all the gangrenous tissue cannot be removed at once, the ulcer is rubbed with iodoform and covered with small pieces of gauze soaked in a 1 to 1,000 solution of potassium permanganate. The scraping is repeated on the following day, and the procedure is repeated until all the gangrenous tissue is removed. Then iodoform is rubbed into the ulcerated surface once or twice daily and the ulcer is washed with permanganate until it is closed by healthy granulations. Special attention is paid to the diet and to the disinfection of the air of the sick room. The children are forced to take nourishment by every possible means.

Stomatitis Diphtheritica.—In the course of pertussis and measles not infrequently aphthous patches appear in the mouth and offer a suitable lodgement for diphtheria bacilli; the susceptible larynx may thus become invaded, and as a complication true diphtheritic croup may develop. Obviously instances of such complicating and serious disease forcibly impress us with the necessity of securing and maintaining thorough cleanliness of the mouth.

Stomatitis Tuberculosa.—In the course of general tuberculosis occasionally small ulcerative patches appear in the buccal mucous membrane. The tendency of the ulceration is to progress. Microscopic examination of the scrapings for tubercle bacilli will assist in distinguishing this form of ulceration from the syphilitic or epitheliomatous form. Evidences of general tuberculosis will also aid in establishing the nature of the affection. The ulcerated areas may be cocainized and attacked with a curette, lactic acid, trichloracetic acid, chromic acid, or the actual cautery.

Stomatitis Syphilitica.—As one of the many manifestations of syphilis, small patches (leukoplakia) simulating the exudates in follicular or aphthous tonsillitis and those occasioned by mercury are observed. The *diagnosis* is arrived at by obtaining evidence of a specific history and noting the other evidences (glandular enlargements, dermatitis specifica) of luetic infection. The affection promptly responds to antisyphilitic treatment. Mild cauterization with nitrate of silver, gargling with chlorate of potassium solution, and a mouth wash of permanganate of potassium solution are valuable aids in the treatment.

Stomatitis Gonorrhoica.—Though of very rare occurrence, still this affection is met with in practice, and is characterized by the appearance of yellowish white patches on the tongue and hard palate. The diagnosis is established by microscopical examination of the exudate for gonococci. As associated evidences of this affection, gonorrhœal vulvitis and ophthalmia may be present. The affection runs a mild, uncomplicated course, and boric acid solution and permanganate of potassium solution for mouth cleansing purpose are efficacious.

Croupous (Membranous) Stomatitis.—Abrasions, wounds, and inflammatory lesions in the mouth are frequently found to be covered with a yellow pseudomembrane which may be diphtheritic or non-diphtheritic. This occurs frequently as a complication of the eruptive fevers and whooping cough, and following operations on the mouth and tonsils. From the mouth it may spread to the nasopharynx and larynx. When it invades the latter, it may manifest itself as membranous croup. *The significance of membranous stomatitis is underestimated in general practice.*

The TREATMENT consists in washing and spraying with non-irritating mouth washes. Listerine, Seiler's tablets in solution, boroformalin, and the internal administration of from two to five drops of dilute hydrochloric acid in sugar water are to be recommended. A culture from the mouth will reveal the presence or absence of diphtheria bacilli. When they are present, 2,000 units of the diphtheria antitoxine should be injected in the usual way, in order to prevent further systemic infection.

Urticaria of the lips, tongue, cheeks, gums, and throat and other mucous membrances is found in connection with skin urticaria and other angeioneurotic manifestions.

Actinomycosis of the Mouth.—The ray fungus, or *Actinomyces*, is the cause of this chronic inflammatory affection. The parasite is found in the pus in the shape of small yellowish granules, made up microscopically of threads radiating from a centre. The fungus is taken in with the food, but may be transmitted in other ways. The author has observed this disease in stable and laundry workers. When localized in the mouth, it first presents itself as a small granulation tumor. The surrounding connective tissue becomes infiltrated, and finally pus foci form in the indurated tissue.

The TREATMENT is by incision, curettage, cauterization, and excision, and the internal administration of potassium iodide.

Leptothrix buccalis is occasionally observed. (See Leptothrix of the Tonsil.)

Foul tongue is occasioned by the presence of retained secretions in the buccal cavity or local disease of the organ itself, and most frequently is due to the existence of digestive disorders or systemic disease.

Tongue Swallowing.—Asphyxia from swallowing the tongue, owing to its riding over and shutting off the opening of the glottis, is occasionally observed. The tongue is drawn back and down over the glottis by the muscles of deglutition, and the condition is due to a congenitally long or large tongue or a lax frenum. It calls for immediate relief. The tip of the tongue may be caught up by the finger, forceps, or suture, and drawn toward the cheek or forward whenever the danger of asphyxiation threatens.

Diffuse Glossitis.—This inflammation is most frequently occasioned by traumatism or the presence of carious teeth causing irritation, or it may be caused by irritants or poisons locally applied. It occasionally follows the use of iodine or mercury. There are swelling of the tongue, salivation, and some fever; the affection is painful, and frequently the tongue is so swollen that deglutition and even respiration become embarrassed.

The TREATMENT resolves itself into keeping the tongue clean, administering cracked ice to allay the inflammation, and the use of fluid food. Should the swelling occasion alarm as to respiratory difficulty, free scarification should be resorted to on the dorsal surface of the organ.

Simple Ulcer of the Tongue and Its Frenum; Dental Ulceration; Riga's Disease.—The presence of carious teeth in the mouth and prolonged friction of the tongue or frenum against the teeth are causes. The introduction of strong destructive irritants or poisons is also a factor in causing the ulcerative process. As a rule, touching the base of the ulcer with a nitrate of silver stick suffices after a few applications to cure. Decayed teeth which have acted as factors are to be extracted or filled. In the adult, ulcer of the tongue occurs as a result of the incessant use of a pipe, e. g., in cases in which the pipe stem acts as an irritant. Should the ulcer not respond to simple treatment as described, or become infiltrated and indurated and extend, we may suspect syphilis or malignant disease, and accordingly treat by radical surgical interference or antisyphilitic therapy.

Syphilitic Ulceration of the Tongue.—Superficial and deep ulcers occurring in the early and later stages of syphilis are frequently enough met. Induration, glandular enlargements, specific dermatitis, and other signs of syphilis serve to distinguish this form of ulceration from tuberculous or epitheliomatous ulceration. The microscope, too, is a most valuable aid in assisting in the differential diagnosis. Where the ulcer is superficial and not much destruction of tissue has taken place, frequent applications of a strong solution of permanganate of potassium will often induce healthy granulation. For deeper ulceration, cauterization with nitrate of silver, the actual cautery, and curettage are indicated. In painful ulceration applications of cocaine solution will afford relief. As accessory agents, mouth washes are to be liberally employed. Most important, however, is the institution of rigid constitutional treatment with large doses of iodide of potassium or the iodides combined with mercury.

Tuberculous Ulceration of the Tongue.—This is not of frequent occurrence, and is seen in cases in which general tuberculosis exists. There is nothing descriptively characteristic of the ulcerative process which may aid one to distinguish by the appearance, this type of ulceration from the syphilitic. There is not the associated glandular enlargement, as a rule, such as we find in the syphilitic form, nor is there much if any induration of the neighboring tissue. The tendency, as with the syphilitic or epitheliomatous variety, is to spread and progress. Instances are on record in which syphilitic ulcerations have been microscopically diagnosticated as tuberculous owing to the accidental presence of tubercle bacilli. Such ulcerations heal promptly under antisyphilitic treatment. Their association with the existing general tuberculous condition aids in arriving at a diagnosis.

TREATMENT.—The treatment, locally, resolves itself chiefly into cleansing the ulcer and cauterizing it with nitrate of silver, and in some instances excision of the ulcer may be indicated. Constitutional treatment and the observance of the hygiene applying to general tuberculosis must of course be carried out.

Epitheliomatous Ulceration of the Tongue; Cancer of the Tongue.—This form, to be absolutely distinguished from other forms of ulceration, requires the aid of the microscope. As a rule, it occurs about middle life, and as contributing causative agents local irritation (carious teeth giving rise to dental ulcer), old scar tissue, and possibly neglected frequent superficial ulcerative processes may be local factors in initiating the progress. These forms of ulcer are generally situated on the side of the tongue, in the bicuspid or molar region, and have a tendency to grow rapidly, spreading downward toward the floor of the mouth and back into the fauces. One characteristic, though not diagnostic, feature is the presence of severe pain and much salivation. The submaxillary glands and those of the neck soon become indurated and enlarged.

TREATMENT.—The treatment is strictly surgical, and extirpation of the ulcerated and surrounding area is to be resorted to when the case is seen early enough in its course. Where there is extension with associated glandular enlargement, extirpation of the organ is imperative, and a secondary operation for removal of the involved glands, submaxillary and cervical, is to be undertaken. Should the disease have reached such a stage that the case becomes unsuitable for an operation, resort must be had to palliative and supportive measures. Locally, frequent applications of cocaine and the use of morphine hypodermically will alleviate much of the patient's suffering and render the unfortunate state bearable. Exposure to the action of x rays, Finssen light, or radium salts may be tried. An operation should not be undertaken until after the patient has had the "benefit of the doubt" (i. e., by antisyphilitic treatment).

Herpes of the tongue is occasionally met. It gives rise to considerable discomfort, but disappears spontaneously. An antiseptic mouth wash may be used.

Swollen Papillæ of the Tongue.—As a result of irritation, *e. g.*, excessive or prolonged smoking, or sudden contact of the tongue with very hot or acid fluids, the papillæ may become swollen. This condition is most frequently seen affecting the papillæ near the posterior portion of the tongue, and it gives rise to a burning sensation in the throat. The swollen papillæ disappear spontaneously, or may be cauterized with 5 per cent nitrate of silver solution. If chronically enlarged, they may be snipped off with a pair of scissors.

Lymphangeioma of tongue, or cysts, or hygroma, may require the actual cautery. Benign tumors should be extirpated.

Salivary Concrements.—Deposits of the contained calcium phosphate or magnesium salts from salivary secretions are occasionally found in the crypts and folds and at the orifices of the muciparous follicles of the buccal cavity, and frequently appear spontaneously in the secretions from the mouth; or, where large and in view, may be expressed by means of a forceps or small spoon.

Ranula.—This condition is the result of occlusion of one or several mucous ducts resulting in cystic formation, and it is most frequently seen on either side of the tongue in the floor of the mouth, protruding and presenting a shining, slightly bluish surface. In many instances profuse salivation is present, and where the cyst is rendered very tense by its fluid contents, pain is an additional symptom.

The TREATMENT is to incise and remove as liberal a piece of the sac as possible, and to avoid coaptation of the edges of the wound, and thus prevent adherence of edges of wound and refilling of the sac. In addition, the edges and cavity of the attacked area may be swabbed with a solution of nitrate of silver to encourage healing.

Herpes of the Lips.—In the course of acute febrile diseases, such as colds, pneumonia, typhoid fever, measles, and scarlet fever, herpetic areas develop on the lips, slightly involving the cutaneous area. The vesicles are painful and have a tendency to dry in from a few days to a week. As a rule there is no spontaneous rupture, and in the treatment the object is to encourage drying of the vesicle, so that the resulting crusts may become less a source of irritation than where attempts at rupture have been instituted. Camphor ice acts admirably as a soothing application.

Perlesche usually starts as a small crack, or fissure, at the angle of the mouth, and in consequence of irritation, licking with the tongue, and subsequent addition of infectious material, it spreads in breadth and depth, assuming an ulcerous character, and is covered with a grayish exudate.

The TREATMENT consists in cleansing the site and touching the fissure or ulcer area with nitrate of silver and protecting with a soothing ointment (camphor ice).

Eczema of the Lips.—This frequent affection attacks the border of the lips, involving the median portion and spreading toward the angle of the mouth. Many minute cracks and fissures are present, and the painful surface bleeds readily. Local applications of mild ointments, such as boric acid with vaseline (10 per cent), or mild zinc oxide ointment with lanolin, will assist in hastening the healing process.

Cracks and Fissures of the Lips.—Local irritation, exposure to cold, and contact of the lips with acrid substances are exciting causes of this condition, which simulates eczema of the lips very much. Camphor ice applied diligently will remedy the condition, and where the fissures become deep, touching with nitrate of silver stick *after stretching the lips* will suffice to cure.

Foul Breath.—Independently of acute or chronic digestive disorders or diseases, we frequently observe a foul breath as an evidence of retained secretions behind the plica tonsillaris, also as the result of dental caries, nasal catarrh, and œsophageal and respiratory diseases. To combat the symptom, independently of the causative factors, antiseptic gargles are indicated. Where the causative factors can be attacked mechanically, they should be removed. Fœtor ex ore is rarely due to chemical changes in the salivary secretion.

Sordes.—In febrile and debilitating disease the lips are frequently coated with a brown mixture of food remnants, epithelial débris, and microorganisms, for which frequent washing and the application of camphor ice are indicated.

THE CARE OF THE TEETH

By William Caillé, D.D.S.

The value of a good set of teeth is not to be computed, if only the service of dividing and masticating the food is considered, mastication being the first step in a series of processes by which the food is transformed into nourishment adapted to the needs of the system. When to this consideration we add their importance in assisting vocalization—distinctness of utterance in speech and song—and also when we consider the intimate relation that exists between the innervation of the organ of hearing and the dental apparatus, it can easily be understood that any pathological condition in the one may cause symptoms referable to the other. As we know, the sensory innervation of the ear is derived from the fifth, or trigeminal, nerve;

this nerve, through the superior and inferior maxillary branches, is the sensory nerve of the teeth.

Thus dental caries is often the cause of severe reflex symptoms more or less remote—such as "otalgia" (pain in the ear) or a general neuralgia in the head. The patient is dosed with medicine for a long time without getting relief, and finally drifts into the hands of a dentist, who finds a badly decayed wisdom tooth to start with. After its extraction (if too far gone to fill) the pain in the ear vanishes. Treatment of all other teeth found to be carious finally results in a general feeling of comfort to the patient, with no recurrence of neuralgia. It is important to bear in mind at all times the possibility of reflex pain from an irritating tooth and also the intimate relation between dental caries and systemic diseases.

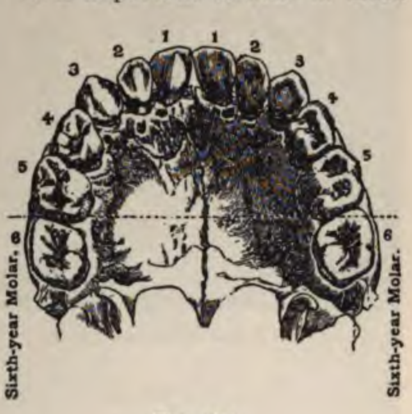

Fig. 103.

The Care and Treatment of the Temporary Set of Teeth

The temporary teeth contain a much larger amount of animal matter than the permanent, are consequently of a less dense structure, and, therefore, are more liable to rapid decay. The pulps of the deciduous teeth are relatively larger than the pulps of the permanent teeth, and when nearly or quite exposed by decay are more susceptible to the action of irritating agents and are more apt to lose their vitality under untoward influence. They demand more care and attention for this reason than the permanent teeth, especially when we consider how very important it is to preserve the first set until their successors are ready to appear.

At about the fifth month after birth the process known as the eruption of the teeth begins. The rule is that the lower teeth precede the upper of the same class by two or three months. They generally appear in pairs. The usual order of their eruption is as follows:

Upper set—Two central incisors, between the fifth and eighth months. Two lateral incisors, between the seventh and tenth months. Two canines, between the twelfth and sixteenth months. Two first molars, between the fourteenth and twentieth months. Two second molars, between the twentieth and thirty-sixth months.

The lower set consists of the same number of teeth, known by the same names. It must not be forgotten that the eruption of the second set begins before any of the first teeth are shed. Thus, between the fifth and sixth years the first permanent molars, four in number, one on each side of the upper and lower jaw, make their appearance. These are generally supposed by parents to belong to the first set, and, therefore, if they are found decayed shortly after their eruption, no attention is paid to them, because it is thought they will soon have to make room for their successors, and before the error is discovered the mischief is irreparable.

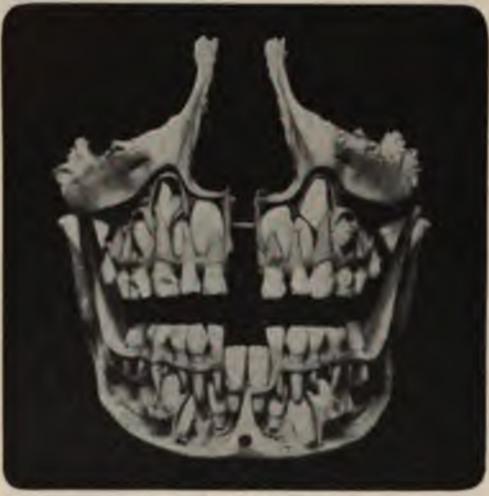
FIG. 104.—At six years.

For reasons not fully understood, a great liability exists in the sixth year molar to deep fissure formation, with imperfect union of the enamel edges, and from this and other causes we recognize a special tendency to caries; in fact, these teeth are frequently decayed before they are fully protruded. This fact shows the importance of extra care and more prompt attention to them, for if they can be preserved until they become thoroughly solidified, their proneness to decay is very much lessened, and the chances of retaining them throughout life are correspondingly increased. The six year molars are the largest teeth in the mouth, consequently they are very important as masticators. The want of a proper appreciation and proper treatment of these six year molars is one of the most fruitful causes of the defective masticating apparatus of a vast majority of people at and beyond forty years of age.

Shedding of the Temporary and Eruption of the Permanent Set

When the small size and delicate structure of the jaws of an infant, and the fact that the teeth correspond to them in size, are considered, it will be apparent that the provision of a second set, large and strong in proportion to the increased size and strength of the adult jaw, is a necessity. Almost coincidently, therefore, with the development of the germ of each temporary tooth, and in what may be termed an appendage to the sac in which it is enclosed, appears the germ of its successor. While, therefore, the development of the temporary teeth is advancing, the germs of the second, or permanent, set are also progressing. When the former make their appearance the latter are in various stages of development.

The second, or permanent, set of teeth are thirty-two in number, the sixth year molars constituting a part of this set. The following tables give the average time and order of eruption of the permanent teeth.

First molar, between five and six years. Central incisors, between six and eight years. Lateral incisors, between seven and nine years. First bicuspids, between nine and ten years. Second bicuspids, between ten and eleven years. Canines, between eleven and thirteen years. Second molars, between twelve and fourteen years. Wisdom teeth, between seventeen and twenty-one years.

The period included between the sixth and the fourteenth years of the child's life is an exceptionally important one with reference to the care of the teeth, their subsequent condition for life depending largely upon the treatment during this period. This attention on the part of the parent or guardian should consist, not only in advising or directing the habitual thorough cleansing of the teeth of the child, but should include a personal supervision of the operation, in order that serious omissions as to time or manner may not occur. In addition, a systematic examination of the mouth by a competent dentist should be made at frequent intervals. Teeth become carious from constitutional as well as local causes.

The difference between individuals in the physical character of the teeth (differences in their organization, ossification, and density, and consequently in their healthfulness, usefulness, and durability) are generally in harmony with other constitutional peculiarities. The size, shape, and structure of the teeth indicate also their liability to decay or their power of resistance to unfavorable conditions. The character and progress of decay vary also in the several temperaments not less than does the original structure—liability to decay—its character and progress being, however, much modified by the state of the general health. Teeth poorly organized may, by reason of favorable systemic conditions and intelligent, persistent care, be made to outlast even those of vastly superior original structure, but which succumb to unfavorable constitutional conditions *or neglect*. The temporary interruption of nutrition by acute infantile diseases, such as measles, scarlet fever, rickets, etc., is generally recorded distinctly in the dental organs.

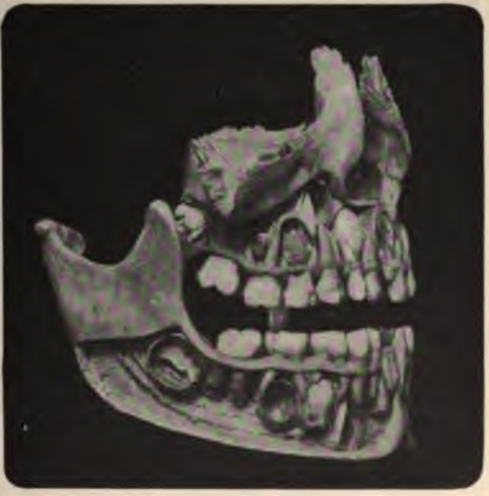

FIG. 105.—At six years.

Teeth regular in their positions, of large size, of a rich yellowish-brown color, with dentin as dense as ivory, and enamel thickly and evenly deposited, represent a vigorous, healthy constitution, whereas teeth that are opaque and chalky, with enamel only semi-crystallized, deficient in quantity, and irregularly deposited, and the dentin soft or friable, represent constitutional poverty.

The teeth are a part, and an exquisitely organized part, of the animal economy. They must, therefore, be more or less influenced by the state of the general health.

Moreover, morbid secretions of the mouth in deranged systemic conditions tend markedly to the production of caries. Irritation of the mucous membrane, such as is caused by an accumulation of tartar which has insinuated itself between the gums and the necks of the teeth, will provoke a mucous secretion decidedly acid, and, as a consequence, destructive to tooth structure, also derangements of the alimentary canal are generally accompanied by acidity of the saliva.

Faulty articulation of the teeth very often prevents a thorough mastication of food, also in children having a mouthful of carious teeth causing acute pain while eating, and forcing them to bolt their food, which soon results in dyspeptic troubles, and a general acid condition of the digestive fluids, which are regurgitated from the stomach to the mouth, acting in this way directly upon the teeth.

Many cases have come to my notice in which faulty articulation could be traced back to mouth breathing, due to nasal obstructions, and requiring years of regulating to bring about a normal position of the teeth. Thumb sucking may in time bring on protrusion of the upper jaw, with subsequent derangement of the teeth. The physician can greatly help toward preventing such a condition, because he generally is in touch with the patient long before the dentist sees him.

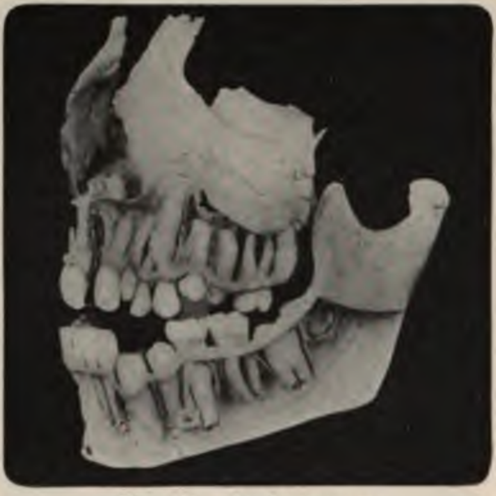

FIG. 106.—At eleven years.

As soon as the child has its first set of teeth, a careful examination of the mouth should be made by a competent dentist, and if any cavities are found, they should be carefully treated, and gutta percha, cement, or amalgam fillings inserted. I mention these three kinds of fillings because they are easily manipulated, and the child is not subjected to a long sitting. For filling children's teeth, I prefer a non-conductive material, such as gutta percha, on account of the supersensitive condition of the temporary set of teeth; this will necessitate seeing the child more often than if metal fillings were used, but it is better in the end.

Three sittings annually are not too many at this period of the child's life, owing to the fact that deciduous teeth easily crumble and break away, and thereby lose the fillings. Parents should teach their children how to use a mouth wash and handle a tooth brush; the child will never forget the importance of this in later years if it is instructed early in life.

The importance of keeping the child's mouth thoroughly clean at all times cannot be emphasized sufficiently. The mouth and nasopharynx are the portal of entrance for many infectious diseases, and a filthy mouth favors infection.

Cleaning the Teeth

If the teeth are properly cleaned on arising, they are freed from glutinous products of bacterial origin, which have vegetated during sleep, and the food that is taken during the day is then not likely to adhere to them; what food does lodge in the interdental spaces may be dislodged by the toothpick or floss. Any particles which remain probably do no harm in the few hours before the bedtime cleansing, because the activities of the mouth during the day will hinder, if not entirely check, the growth of microorganisms. The bedtime cleansing will, as far as possible, remove fermentable matter from the mouth which has accumulated during the day. Brushing with a dentifrice may be supplemented with floss and an antiseptic and alkaline wash.

Antiseptics for oral use should be alkaline in reaction, not merely neutral but *distinctly alkaline*. A perfect dental antiseptic, besides being alkaline, should not coagulate albumin. It should be a powerful non-irritating deodorant.

Remarks on Pulpitis-periostitis, Alveolar Abscess, and Alveolar Pyorrhœa

In toothache from pulpitis decomposed food acts as an irritant on the exposed pulp and nerve. A filling carelessly inserted and producing pressure on the vital part of the tooth may also cause pulpitis and ultimately the death of the tooth. Supersensitive teeth, into which a metal filling is inserted without first taking the precaution to line the cavity with some non-conducting material, frequently give trouble, as do metal filled teeth, with cavities extending almost to the pulp. Patients so afflicted complain of soreness and tenderness while eating and drinking. Toothache from pulpitis and periostitis is the most common form. Local inflammation may sometimes be checked by local applications, such as a hot water bag, a hot poultice of tea leaves, capsicum plaster applied over the dry gums, or equal parts of tincture of iodine and tincture of aconite applied to the gums by means of a brush or swab. Care should be taken not to allow the mixture to flow back into the mouth. After periostitis is more marked, the tooth may often be saved by opening up the pulp chamber. Relief is immediate, and subsequently the devitalized nerve may be removed and a general antiseptic treatment and final filling will be indicated. Alveolar abscess is treated by free incision, and alveolar pyorrhœa is treated by removing the source of irritation and by the prolonged use of antiseptic and astringent mouth washes.

Remarks on the Emergency Treatment of Toothache

The dentist is, of course, in the best position to intelligently manage a toothache, but for the benefit of those out of reach of a dentist the following advice is given:

Clean and dry the cavity by means of absorbent cotton on a wooden toothpick, and insert a pledget of cotton saturated with the following preparation:

℞ Orthoform,	1½ parts;
Phenol (crystallized),	1½ parts;
Camphor,	4 parts;
Chloral hydrate,	4 parts.

M.

The cotton pledget must not be too large, allowing room for a second pledget of cotton saturated with sandarac varnish. In a few minutes the varnish solidifies and protects practically as a waterproof filling. This method is very effective when we have an exposed pulp to deal with. Validol camphorate can be used in the same manner with good results, and as the Validol does not injure the surrounding tissues, it is especially valuable and safe in the hands of the patient.

Brief Remarks on the Regulation of the Teeth

The time that is generally considered most favorable for correction is between the thirteenth and eighteenth years; however, the health and strength of the patient at the time of any proposed operation for irregularity is so important a consideration that it must not be disregarded. The individual is passing from the stage of childhood into that of manhood or womanhood, and in this change, *especially in the case of the female*, the life forces are taxed to the utmost. At this time also the mental faculties are being severely strained by study, in consequence of which, if the physical culture of the individual is neglected, as it too often is, the nervous system becomes unduly exalted. To meet and partially compensate for these drains upon the system, it is most important that full nutrition be sustained. To do this with teeth that are sore or tender to the touch by reason of operative interference is impossible, and hence the system will be still further weakened by lack of nourishment if any severe operation is undertaken. It is, therefore, much better to postpone the operation until a time when the vital power can stand the strain.

Family Type of Dental Deformity

When any great deformity of the teeth and jaws, such as anterior protrusion of either jaw or a V-shaped arch, is shown to be hereditary, it is well to take into consideration the hereditary feature of the case before beginning any work for correction. Where the irregularity is known to have been acquired in the parent of the child, and thus to have been transmitted but once, the difficulties in the case are not so marked, because the type has scarcely been confirmed; but where it has been transmitted through two or more generations the impress is strong and difficult to overcome. In the latter case the correction of the deformity will not be more difficult than usual, but after correction the tendency of perverted nature to cause a return to the family type will be so strong as almost to baffle us in our attempts to preserve the advantage we have gained.

CHAPTER VI

THE DIGESTIVE SYSTEM—*Continued*

DISEASES OF THE ŒSOPHAGUS

SYNOPSIS: Remarks.—Anomalies of the Œsophagus, Thrush, Œsophagitis, Ulcer, Cancer, Stricture, Sacculation, Paralysis, Rupture, Foreign Bodies in the Œsophagus.

INTRODUCTORY REMARKS

Function of the Œsophagus.—The function of the œsophagus is to carry food by successive contractile efforts from the pharynx to the stomach. Food is probably carried down by the œsophagus to a point below the bifurcation of the trachea, from which point it is squirted into the stomach upon the relaxation of the cardia. This accounts for the delay of from six to ten seconds between the first and second swallowing sounds which are heard at the tip of the seventh costal cartilage on the left side. The action of the œsophagus is involuntary and it applies alike to both fluids and solids. The muscular tube is innervated by the pneumogastric nerves; hence diseases affecting these nerves affect the act of deglutition.

Composition.—The wall of the tube is composed of three layers, a muscular, submucous, and mucous. The muscular coat consists of a layer of longitudinal and another of circular fibres. The submucous coat contains the mucous glands. The lining, or mucous, coat is made up of stratified epithelium, the superficial or innermost layer of which is squamous. The knowledge of this minute anatomy will explain the terminal effects of injuries to the tube, whether mild or severe, depending upon which coat has been injured.

Position.—The position of the œsophagus is slightly to the left of the median plane down to the fifth dorsal vertebra, from which point it inclines more to the left, ending at the cardiac orifice of the stomach. This point lies opposite the tip of the seventh costal cartilage, 2.5 cm. to the left of the sternum and about 10 cm. posterior. Posteriorly the point of orientation is the fifth dorsal spine, thence descending to the left of the ninth dorsal spine.

ANOMALIES OF THE ŒSOPHAGUS

Congenital fistula due to the failure of growth in fœtal development between the second and third branchial arches. The opening is above and external to the sternoclavicular articulation. A fistulous opening communicating with the trachea may exist.

The œsophagus may be absent.

Obliteration of the lumen, leaving a fibrous cord to indicate the continuity of structure.

Stenosis of the œsophagus may be congenital and give little or no inconvenience until late in life.

Dilatations of the lumen may be congenital or may accompany stenosis, being situated immediately above it. *Sacculations, or diverticula, may* be congenital or may be due to a weakened wall yielding before the pressure of swallowing. Such formations are usually at the commencement of the œsophagus. Sacculations may also be due to adhesions and tension from without, or to cicatricial contraction within.

Thrush of the œsophagus often accompanies thrush in the mouth in infants and yields to the treatment directed against this condition.

ACUTE INFLAMMATIONS OF THE ŒSOPHAGUS

Acute inflammations of the œsophagus may be due to or accompany:

1. *Acute fevers* when severe as in diphtheria, pneumonia, typhoid, smallpox, and pyæmia. 2. *Mechanical, chemical,* or *thermal traumatism,* when bodies capable of inflicting such injury have been swallowed. 3. *Cancerous inflammation* involving neighboring tissues, but not having yet invaded the œsophagus itself. 4. *Some unknown cause,* hence appearing spontaneously, as in sucklings, with or without ulceration.

Symptoms.—Symptoms of inflammatory conditions are more or less alike and are: Pain on swallowing, especially acute. Sometimes constant dull pain beneath the sternum. Regurgitation may be present, if there is a foreign body in the œsophagus. The diagnosis of the exact condition will depend upon the history and examination. The use of a *bougie* or *œsophagoscope* is contraindicated during the acute stage.

Treatment.—The treatment of œsophagitis depends upon the severity of the condition. If it is mild or slight, no special treatment is required other than with soft foods or demulcent drinks. In severe cases resort to rectal enemata and give no food by the mouth until the acute symptoms have subsided. Demulcent drinks and ice by the mouth may be used to relieve pain. Cold may be applied externally to the neck or sternum. Analgetics may be a necessary addition when severe symptoms exist. After corrosives have been swallowed we expect cicatricial contractions or strictures to show themselves in from three to six months. Bougies should be passed before that time to prevent the narrowing of the lumen and the occurrence of such a complication.

CHRONIC INFLAMMATIONS OF THE ŒSOPHAGUS—ULCER AND CANCER

Chronic inflammatory conditions of the œsophagus, with and without *softening*, may follow the acute conditions mentioned above.

Ulcers.—Ulcers of the œsophagus may occur in cachectic conditions, diabetes, nephritis, hepatitis, or malignant disease, including tuberculosis. In chronic heart disease with disturbed portal circulation the veins of the lower portion of the œsophagus may be dilated, and the lining membrane be covered with mucus due to a chronic catarrh. If these veins ulcerate through, or rupture from any cause, the patient may have a severe hæmorrhage, or may bleed to death without giving evidence of the hæmorrhage. The blood in such cases may be swallowed and retained in the stomach and intestines, or there may be slight hæmorrhage and vomiting of the blood, and it will be a difficult matter to decide whether it is an œsophageal or a gastric hæmorrhage. Again, the blood may be swallowed and pass per rectum and this be the only evidence of the hæmorrhage. The use of the *œsophagoscope* is a help in such conditions, especially if there are old ulcers, but it must be used with the greatest care.

Cancer.—Cancer of the œsophagus is usually of the epithelioma type and may or may not ulcerate early, due to the mechanical irritation of the food.

If the growth causes much *stenosis, we get a gradual dilatation of the tube above the tumor* due to accumulation of food distending it. This food may later be swallowed, but is usually regurgitated. As the cancerous growth advances it in volves the neighboring organs and may thus perforate into the trachea, pericardium, aorta, or pleura or even erode the vertebræ.

SYMPTOMS.—*Cancer of the œsophagus* is more frequent in men over fifty, and it is accompanied with progressive dysphagia, first for solids and then for liquids, and rapid emaciation. Regurgitation may occur early or late. Pain may be a constant feature or occur only after eating food. Enlargement of the cervical glands may occur. Three conditions simulate malignant disease—senile dysphagia, nervous dysphagia, and an œsophageal pouch. Spasmodic stricture may be caused by dyspepsia.

DIAGNOSIS.—The diagnosis is made by the passage of the bougie and from the symptoms enumerated.

PROGNOSIS.—The prognosis is hopeless, and the usual mode of death is from asthenia or sudden perforation of some vital organ.

TREATMENT.—The treatment is to relieve the suffering, resorting to morphine, codeine, and cocaine without hesitation. Analgetics dissolved or suspended in *mucilage* give relief. Gastrostomy is advisable, if done ealy, before asthenia is too pronounced. The use of the x-ray or radium has not been successful, though one case can be vouched for by the author where the stricture has been relieved and life apparently prolonged after a course of x-ray exposures. Radium as a *cancer* cure has not given satisfactory results. In every case of malignant disease the patient should have the benefit of the doubt and receive antisyphilitic treatment.

STRICTURE, PARALYSIS, RUPTURE, ETC.

Stricture of the œsophagus may be:

1. *Congenital.* 2. Due to *cicatricial contraction* following ulcers due to corrosives, syphilis, or typhoid. 3. A result of *tumors*, benign or malignant, in the wall, narrowing the lumen. 4. Caused by *pressure* from *without*, as of aneurysms, swollen lymph glands, enlarged thyreoid, pericardial effusion, and tumors not involving the wall itself.

Diagnosis.—The *diagnosis* of the true condition will depend upon a close study of the history and physical signs. From the history we may learn of the occurrence or non-occurrence of any previous traumatism, or inflammatory condition, with or without a general or constitutional disease. The rapidity of the increasing severity of the symptoms is an important point.

Symptoms.—Concomitant symptoms in other organs should be noted especially. If *regurgitation* is present, the time of its occurrence with respect to the ingestion of food is a fair indication of the position of the stricture. Regurgitation immediately after swallowing indicates a high position of the stricture, but, if it is delayed, a low position. The fact that the food is regurgitated, and not vomited, can be discovered by the odor, the absence of hydrochloric acid, and the unchanged condition. Auscultation for a delayed second swallowing sound also helps. Then, lastly, we may try the passing of bougies, beginning with the largest size of the olive tipped. Gentleness in manipulating a bougie is imperative, because of our ignorance of the actual condition and the possibility of rupturing the œsophagus and puncturing an important viscus.

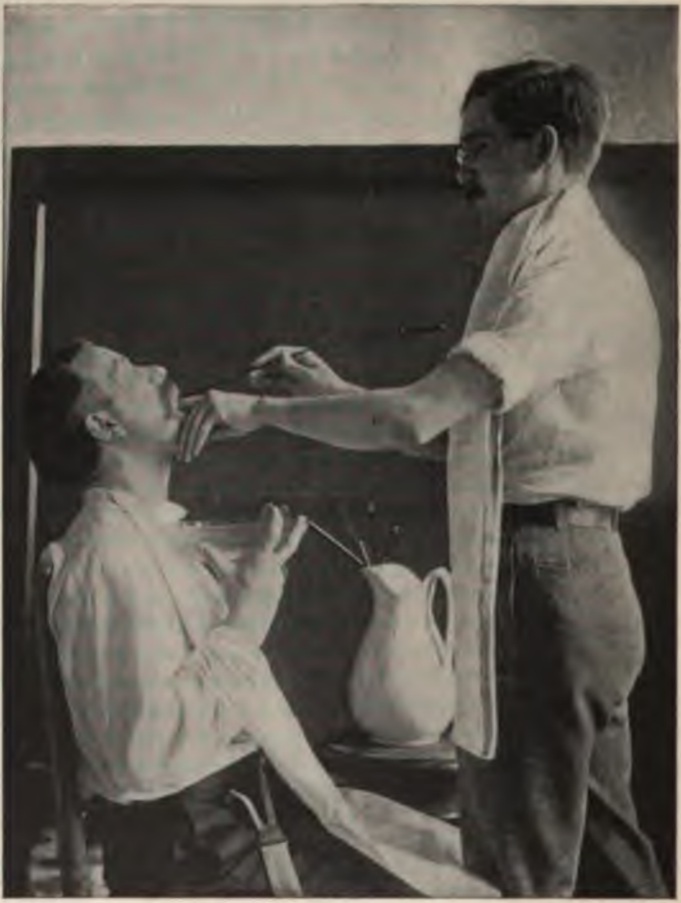

FIG. 107.—INTRODUCING ŒSOPHAGEAL BOUGIE.

Spasm or spasmodic stricture may occur in hysteria, hypochondriasis, chorea, epilepsy, idiocy, or hydrophobia and after irritation by foreign bodies. It may be a very painful condition, especially if some sharp body has been swallowed, and persist for a day or so, or even continue for weeks. The actual damage may be very trivial, but the nervous spasm and sensation of pain will persist.

THE TREATMENT of such a condition is that of the general constitution. Sometimes a cure may follow the passing of a bougie, especially in neurotic conditions, if done with demonstrative formality. The bougie may or may not be arrested at the site of the stricture. Organic stricture of a non-malignant character requires dilatation by means of flexible bougies or it must be overcome by surgical means. A low down lesion can be reached by opening the thorax under negative pressure.

Paralysis of the Œsophagus

Paralysis of the œsophagus is very rare and usually of central origin, as in bulbar paralysis. Following diphtheria, there may be a peripheral paralysis.

Prognosis.—The prognosis in the first would be hopeless, while in the second it would be good, unless the paralysis extended and involved some vital organ.

Rupture of the Œsophagus

Rupture of the œsophagus from violence or in the course of cancerous softening has a fatal termination.

Foreign Bodies in the Œsophagus

Foreign bodies in the œsophagus can be located by means of the bougie and by the use of x rays. The use of the Röntgen ray in the diagnosis of *foreign bodies in the œsophagus* is of the greatest value only when those bodies are metallic, as we then obtain a definite outline of them and their location. If the body is of some other material, we must use the greatest care in forming an opinion of the importance of the shadows on the plate. In such cases it is best to make two or more plates at intervals of some days, and compare them carefully. Even with the most careful comparison the x ray is not a positive factor in such diagnosis. One case has been recently recorded of an eminent surgeon who depended upon the x ray for the diagnosis of the position of a tooth plate said to have been swallowed by a patient. It was apparently located at the cardia, but when gastrotomy was performed nothing was found. The next day the tooth plate was found in a crevice of the bed.

Fish bones and other *small foreign bodies* can sometimes be extracted by means of the *bristle probang;* coins and tin whistles by the *coin catcher.* When a foreign body is located and cannot be removed by such means or cannot be pushed into the stomach, surgical methods of removal must be adopted.

CHAPTER VII

THE DIGESTIVE SYSTEM—*Continued*

CLINICAL PATHOLOGY OF THE STOMACH AND INTESTINE AND DIAGNOSTIC TECHNIQUE

SYNOPSIS: Clinical Pathology of the Stomach, Motor Phenomena, Sensory Phenomena of the Stomach.—Secretory Phenomena of the Stomach.—Hydrochloric Acid in the Stomach, Digestive Ferments.—Diagnostic Technique.—Transillumination with Fluorescein.—Remarks on the Clinical Pathology of the Intestine.—Motor, Sensory and Secretory Phenomena of the Intestines.—Diagnostic Technique.—Examination of Fæces.—Conclusions.

REMARKS ON THE CLINICAL PATHOLOGY OF THE STOMACH

A healthy stomach mechanically and chemically prepares the food for the intestines, and very little absorption takes place in the stomach proper. The normal motor function of the stomach is fairly understood. The fundus has a peristaltic action with little interior tension; the pyloric antrum has a strong muscular action with high interior pressure. A sphincterlike arrangement closes this segment against the fundus and permits the gastric contents to flow through the relaxed sphincter at the pylorus into the intestine. A very slow transfer of contents may be followed by a dilatation of the stomach and an undue formation of gas and fatty acids.

Motor Phenomena and Neuroses

Regurgitation and Vomiting; Singultus.—The cardia of the stomach will open during the act of swallowing.

Regurgitation and eructation of gases, air, and fluids may take place from the œsophagus or stomach. If they are from the latter, hydrochloric acid and fatty acids will give an acid taste in the mouth (pyrosis, water brash).

Vomiting is due to a complex muscular action of the stomach and diaphragm combined. The impulse takes its origin in the medulla, near the respiratory centre, and may be due to local brain irritation or to a reflex from the abdominal vagus nerve, and the salivary glands also participate in the act. We speak of nervous, paroxysmal, and reflex vomiting; cerebral or toxic vomiting from alcohol, apomorphine, chloroform, ether, sewer gas, bacterial poisons, sepsis, and uræmia. Reflex vomiting, if cerebral, is usually projectile and unattended with nausea or pain. It may be a premonitory symptom of apoplexy or associated with meningitis, hydrocephalus, brain concussion, etc.

Spasms of the stomach, pylorus, or cardia are frequently observed, also peristaltic unrest and peristaltic atony.

Dilatation of the Stomach.—A dilated stomach acts like a dilated heart—its cavity does not empty itself. Pyloric stenosis is accompanied by dilatation of the stomach and is often compensated by hypertrophy of the gastric muscularis with subsequent degeneration of the muscular elements. Anomalies of form and position favor such changes, and then we speak of motor insufficiency.

A dilatation without pyloric stenosis is found in connection with supersecretion, hyperacidity, and neurasthenia. Atony of the stomach may be *due* to undue fermentation and may *cause* undue fermentation or putrefaction.

Speaking generally, we may affirm that in *atony* without dilatation the stomach is empty if examined in the morning before breakfast. This *denotes weak peristalsis.*

In *atonic dilatation* the stomach is not obstructed, but is unable to empty itself, and food is found in washing the stomach in the morning.

In *dilatation* due to *pyloric obstruction* we speak of secondary dilatation as we find it in cancerous, fibrous, or cicatricial obstruction. The wash water will show food in all stages of putrefaction.

Sensory Phenomena of the Stomach

In health we feel the stomach when we are hungry or when we overload it, and a sick stomach will show the overloaded feeling after a small quantity of food has been taken. Actual pain in the stomach (*gastralgia*) is constant in ulcers and cancer from irritation of HCl and organic acids. Clonic muscular contraction in the walls of the stomach and intestine also produces pain. Neuralgia of the stomach is observed in stomach neurasthenics and in tabetic subjects. Many phenomena in various parts of the body are of gastric origin, such as *epileptoid* and *tetanic seizures,* vasomotor phenomena, paræsthesias, and neuralgias of various parts, also migraine, vertigo, cardiac irregularities, and asthmatic complaints.

Disorders of the Appetite.—*Anorexia* is a simple loss of appetite often observed in old people, in nervous people, and in persons who are under great mental strain (anorexia mentalis). *Polyphagia,* or *bulimia,* may be permanent or paroxysmal. It is an inordinate craving for food in convalescence from febrile disease and in some insanities and hysteria, etc. *Akoria* is a feeling of emptiness. *Pica* is a craving for unusual substances, observed in hysteria, idiots, and children. *Thirst* may be increased or annulled in fever, in diabetes, or from a dry mouth. *Idiosyncrasies* are aversion to certain foods.

Other sensory phenomena are *anæsthesia, hyperæsthesia, paræsthesia, nausea,* and *abnormalities of appetite.*

Secretory Phenomena of the Stomach

Gastric Juice.—Healthy individuals may have a small quantity of gastric juice in an empty stomach. When this quantity is increased, we speak of supersecretion with or without hyperacidity (1 to 2 per cent). Such conditions are known to be present in *chronic dyspepsia*, in *neurasthenia*, and in serious *nervous disease*, such as locomotor ataxia. Therefore not every case of dyspepsia has its origin in the stomach or requires local treatment. Stomach supersecretion may be a distinct nervous manifestation similar to salivation in bulbar paralysis. Superacidity without supersecretion is a common occurrence in ulcer of the stomach. Supersecretion and superacidity are usually associated with pain, vomiting, dilatation of the stomach, and cachexia.

Injuries of the stomach mucosa or a localized venous thrombosis are apt to turn into peptic ulcer when supersecretion is present. Mycotic necrosis is another potent factor in the causation of peptic ulcers.

Stagnation.—Stagnation of the stomach contents favors microbiotic action. If stagnation and free HCl go together, putrid fermentation is rare. Stagnation and anacidity favor putrid action. When undue fermentation exists without motor or secretory disturbances, the quality and quantity of food are usually at fault and the cause of dyspeptic symptoms.

The **secretory neuroses** are called *gastrosuccorrhœa*, *hyperchlorhydria*, *hypochlorhydria*, and *nervous dyspepsia.*

Hydrochloric Acid, HCl

Hydrochloric acid is secreted by the stomach and combines with the various stomach contents, notably the proteids. The carbohydrates are acted upon by the saliva. In healthy adult stomachs HCl is secreted in such quantities that it can be detected as a free acid. In young infants this is not the case. During the height of digestion free HCl reaction is present.

Hyperacidity.—Continuous hyperacidity is found in chlorosis and in neurotic dyspepsia, is often present in simple ulcer, and may be a symptom of the early stages of chronic gastritis. It speaks against carcinoma except when a simple ulcer is undergoing carcinomatous metaplasia.

Subacidity.—Continuous *subacidity* under 1 per cent is found in chronic gastritis, especially with dilatation and atony, in some cases of simple ulcer with chronic gastritis, and in incipient carcinoma. It is also found in anæmia, tuberculosis, and other cachexias. A decrease of HCl interferes with the splitting up of the proteids and decreases the antiseptic action of the gastric juice.

Anacidity.—Anacidity is a persistent symptom of the later stages of chronic gastritis, when pepsin is also lacking. When pepsin is present, it indicates a neurosis. In combination with other signs anacidity speaks for carcinoma.

A true anacidity is rare, but has been observed in cases of achylia gastrica.

Therapeutic Value of Hydrochloric Acid.—The gastric juice possesses antiseptic and germicidal properties. These properties are referable to the presence of free HCl. A subnormal amount of HCl will call forth an increased amount of intestinal putrefaction (subacidity, anacidity). A normal acidity of the gastric juice is never associated with increased indicanuria, except in ulcer, when hyperchlorhydria and increased indicanuria go together.

For supplementing the digestive work of the stomach and improving the appetite, the author has used HCl for twenty-five years of his professional life in adults and in children over two years of age, and there is no drug in the pharmacopœia which has given him more satisfaction. The indication has been a *coated tongue*, irrespective of the underlying condition, and even in cases of fermentative dyspepsia with acid eructation, the administration of HCl has been followed by far happier results than resulted from the administration of alkalies. No amount of theoretical reasoning will dispose of clinical experience. In only a few cases will the HCl not be tolerated, and if the tongue fails to become clean after its use, there is usually some grave organic change in some organ. In the presence of hyperchlorhydria HCl is not indicated.

Hydrochloric acid favors proteolytic action of the pancreatic juice (Rachford), and the therapeutic administration of hydrochloric acid to aid digestion finds an additional indication by reason of this fact. The beneficial action of hydrochloric acid is not confined to the stomach, but as combined hydrochloric acid it is continued in the intestinal canal, where it not only aids the pancreatic digestion of casein, but also acts as an intestinal antiseptic. For the mode of administration, see chapter on General Therapeutics.

Bitter tonics, such as nux vomica, strychnine, quassia, gentian, and quinine may be given in combination with HCl.

Digestive Ferments

The principal digestive ferments are *ptyalin*, *pepsin*, and *pancreatin*.

Ptyalin.—Ptyalin may be practically discarded, for we know very little as yet about the altered chemistry of the saliva. Amylaceous dyspepsia will hardly exist in a person who chews slowly. The market is flooded with preparations of diastase, pure or in combination with laxatives, tonics, and antiseptics, but the author is unable at the present time to give exact indications for their use. The pineapple also contains a ferment which can be administered as pineapple juice.

Pepsin.—Marked diminution of this principle or its absence indicates a corresponding disturbance of glandular activity. It may exist with a variety of lesions.

Pepsin acts in an acid medium (hydrochloric acid); pancreatin acts in an alkaline medium.

Pancreatin.—Pancreatin is practically indicated only in atrophic gastritis.

℞ Pancreatin., } āā, ...gr. viij.
Sodii bicarb., }
M. Sig.: After meals.

Other Aids.—Artificial means of aiding digestion (other than HCl) are too readily prescribed and ordered at random. In ordinary nervous dyspepsia it is best to stimulate the stomach secretions by putting solid food into the stomach and aiding digestion with a few drops of dilute hydrochloric acid, to be taken in water after meals, *not by administering digestive ferments*. In a case of bilateral parotitis with a dry mouth and no flow of saliva the writer has given malt and taka diastase to advantage.

Lactic acid is not a normal product of stomach digestion. It is often ingested with food and forms early in digestion when milk and bread have been taken. It is present in larger proportions in dilatation with stagnation of contents. If associated with retention and absence of HCl, it makes the suspicion of carcinoma strong, but its presence is not pathognomonic of carcinoma, because it is also found in functional stomach disorders and in gastritis gravis.

Zymogen.—The production of zymogen is a staple function of the stomach mucosa.

Alkalies neutralize gastric acidity and are supposed to stimulate gastric secretion. It is the author's experience that in fermentative dyspepsia with acid eructations (fatty acids) without pain, a brisk laxative, followed by HCl, is superior to the alkaline management. In hyperacidity and ulcer and various forms of dyspepsia with pain after eating the alkalies are indicated. Alkalies are indispensable in lavage to dissolve mucus in the stomach. The beneficial effects of alkaline mineral waters (Carlsbad, Ems, Vichy, Saratoga) are most marked in those cases in which diet, exercise, massage, hydrotherapeutics, and freedom from worry are secured. Bismuth subcarbonate, magnesium carbonate, and sodium bicarbonate are the alkalies usually administered. Alkalies may be combined with morphine for the purpose of overcoming severe pain.

Diagnostic Technique. (See also Laboratory Aids.)

We determine the location, size, and capacity of the stomach by percussion, palpation, and auscultatory percussion. The fundus is the highest point in the stomach and reaches the level of the ninth dorsal vertebra. The lesser curvature is usually covered by the liver; the upper greater curvature is covered by the lung; the pylorus is covered by the right lobe of the liver.

Gastric distention can be made out by inflating the stomach. The patient swallows a teaspoonful of sodium bicarbonate in eight ounces of water, and immediately half a teaspoonful of tartaric acid in the same amount of water. An evolution of CO_2 takes place in the stomach, and the organ stands out prominently and can readily be palpated or percussed. Location, size, and capacity determinations are more or less fallacious, but can be made by auscultatory percussion (Plätschergeräusch splashing sound). Gastrodiaphany, or transillumination of the human stomach by means of a swallowed small electric lamp, was first practised by Dr. Einhorn, of New York.

Transillumination of the stomach with fluorescein was introduced by Kemp and Lincoln, of New York. It may be used in stout as well as thin persons with good results; even in the colored race the results are fair. The method employed is as follows: Give the patient 10 gr. or more of quinine during the day of examination or the day previous. Introduce the lamp. Have the patient drink a glass of water in which has been dissolved 30 to 40 gr. of sodium bicarbonate, to render the gastric contents alkaline. Allow another glass of water to be taken, into which has been placed ⅛ gr. of fluorescein, 1 dr. of glycerin, and 20 gr. or more of sodium bicarbonate. The abdomen being bared, conduct the patient into the dark room, or, if at night, simply turn out the lights. It is better to introduce the lamp before the solution, so that should there by any chance be any trouble, the fluorescein will not be vomited.

X Ray Examination.—By introducing a soft rubber tube with a metallic chain in its centre, the location of the stomach can be ascertained as a shadowgraph. Bismuth powder thrown into the stomach with a powder blower might facilitate the taking of an x ray stomach shadow. Illumination of the stomach by means of radium is unsatisfactory.

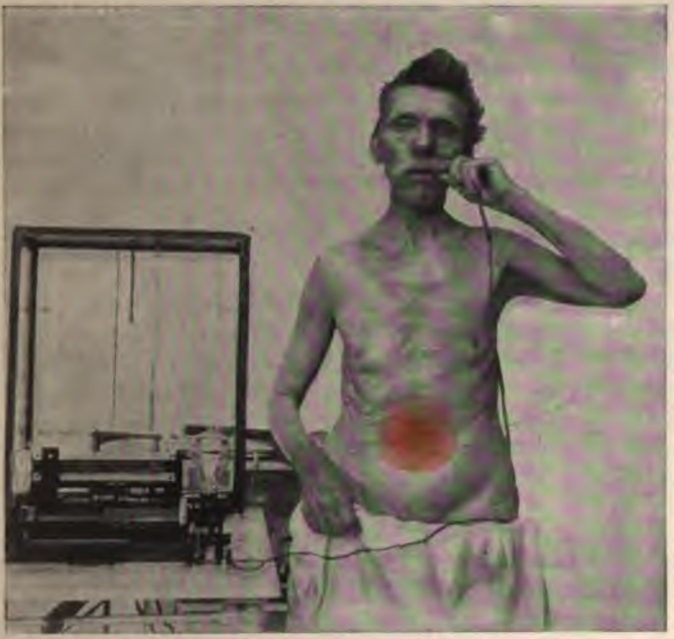

Fig. 108.—Illumination of the Stomach by means of Fluorescein and the Electric Light.

Method of Testing the Motor Function of the Stomach.—The peristaltic function of the stomach is the most important one, because the secretory and resorptive function of the stomach may be assumed by the intestines. When the motor function of the stomach is interfered with, food must remain in the stomach and accumulate and finally be vomited as in pyloric stenosis. There are six or seven methods of testing the motor functions of the stomach. The simplest for the general practitioner are the tests of Leube and Ewald.

Leube's Test.—Give a test breakfast and ascertain by means of the stomach tube after two hours whether solid contents are still to be found in the stomach. When the tube is in the stomach the patient strains as if at stool. If no contents arise, push the tube in or out and use external pressure over the stomach. If nothing arises, the stomach is empty or the tube is blocked by large portions of food. To ascertain the latter, pour in half a pint of water through a funnel. If nothing but water returns, the test meal has passed into the intestines.

Ewald's Test.—Give one grain of salol. Normally it can be recognized in the urine in from forty to seventy-five minutes. Delay in its appearance will indicate a retardation of the passage of food into the intestine. It is recognized in the urine by the violet color produced on the addition of neutral ferric chloride.

The "SCHLUCKGERÄUSCH," heard at the ensiform cartilage, is of diagnostic import in stricture of the œsophagus and cardia, but in the absence of such lesions it is a variable phenomenon.

The chemical examination of the stomach contents is made by siphoning out the stomach after a test meal and applying the tests as given in the chapter on *Laboratory Diagnosis*.

EWALD AND BOAS TEST BREAKFAST.—One piece of wheat bread, one pint of water or tea without milk or sugar. Time for examination, one hour after the meal.

LEUBE AND RIEGEL TEST DINNER.—A plate of soup and a portion of roast beef. Time for examination, three to four hours after meal.

FLEINER'S TEST MEAL.—Soup, roast beef, and potato purée. Time for examination, three to four hours after meal.

DOUBLE TEST MEAL.—8 a.m. Two and a half ounces of scraped and broiled beef, one soft boiled egg, one ounce of boiled rice, one glass of milk, a piece of bread.

12 m. Follow at noon by Ewald's breakfast. Examine one hour later.

Gross Interpretation.—The absence of all proteids and the presence of carbohydrates, rice, and bread point to hyperchlorhydria. The presence of the entire meal, with milk uncurdled, means impaired motility, atrophy of the mucosa, or absence of acid. (See also Laboratory Diagnosis.)

TO TEST GASTRIC RESORPTION.—*Method of Penzold and Faber:* Five grains of potassium iodide are swallowed in a wafer with three and a half ounces of water. It can be detected in the saliva and urine in from six and a half to eighteen minutes by means of starch paper, which, when wet with saliva or urine and touched with fuming nitric acid, shows the blue iodine reaction. There is a reduced absorption in carcinoma.

For Sahli's test for gastric absorption see Laboratory Aids.

REMARKS ON THE CLINICAL PATHOLOGY OF THE INTESTINE

Experiments have shown that in the *absence of bile* in the intestine proteids and carbohydrates undergo their usual metabolic changes, and about 60 *per cent of fats are not absorbed*. They are split up by bacteria and by the pancreatic juice, and their products irritate the intestine. Thus fats are harmful in the absence of bile. Bile has a certain antiseptic power over intestinal bacteria, and as the absence of bile favors constipation, an overproduction of bacteria results. The absence of pancreatic juice in the intestine is rare. There are two openings of the pancreatic duct. The duct is seldom closed by concrements, and a complete degeneration of the organ is rare. We have no very reliable data regarding the behavior of proteids and carbohydrates in the absence of pancreatic juice, but it is certain that much of the fat taken into the body is found unchanged in the fæces.

The intestine receives from without with the food and drink a great variety of substances, including pathogenic and non-pathogenic bacteria, and behaves toward them according to condition and idiosyncrasy. Food ptomaines are absorbed by the intestine and injure it or poison the organism. Many bacteria which get into the stomach are killed therein, others lose their virulency, and still others go unchanged into the intestine. Those able to withstand an acid medium become active in the small intestine; others thrive in neutral or alkaline media and develop in the colon, where there is less peristalsis.

An invasion of the organism by bacteria is hindered by an intact epithelial lining, but soluble products of bacterial action are absorbed and may offer to the organism a protection against the bacteria themselves. Pathogenic bacteria may die in an acid stomach or pass through the intestine and fail to find a foothold in the intestinal mucosa. The cholera vibrio is particularly virulent in dyspeptics with subacidity.

The substances which originate in the intestine and irritate the same are lactic, butyric, and acetic acids, sulphureted hydrogen, aromatic bodies, bacterial poisons, and ptomaines. The frequent complication of nephritis in the course of intestinal troubles is due to the absorption of poisons. In endemic dysentery protozoa (amœba) have been found in the intestine.

Absorption of nutritive material takes place principally in the small intestine. Sugar and albumen are taken into the blood, and fat is taken into the lymphatics. In diseased conditions the power of absorption is lessened, and diarrhœa results. In some forms of diarrhœa the liquid stools are due to increased transudation of the intestine

Motor Phenomena

Singultus, or hiccough, results from sudden contraction of the diaphragm. The mild form of hiccough is of little importance, but its occurrence in serious illness adds to the gravity of the prognosis. (See also chapter on General Therapeutics.)

Nervous constipation and *nervous diarrhœa* are discussed under Constipation and Diarrhœa.

Enterospasm and proctospasm are contractures of the muscular fibres of the intestine and rectum, with and without pain, causing transient constipation or obstruction of the bowel.

Peristaltic unrest and retroperistalsis are motor phenomena of the intestine observed in bowel obstruction and also in neurotics.

Atony of the intestine is frequently observed in atrophic and rhachitic infants, in neurasthenic adults, and in paresis and paralysis of the intestinal muscularis from local or central cause. The abdomen is usually tympanitic, and auscultation shows absence of gurgling gut sounds, moreover, the intestine does not empty itself.

Sensory Phenomena

Colic and painful crises are frequently observed. When gall stones and renal colic can be ruled out, there may be intestinal colic from various causes—flatulence, appendicular colic, lead colic, mucous colic, and crises of nervous disease.

Rectal neuralgia without appreciable local cause is observed in anæmic and neurotic individuals. (See Rectum.)

Secretory phenomena, such as nervous diarrhœa and colica mucosa, are discussed clinically.

Diagnostic Technique. (See also Laboratory Aids.)

Inspection.—Simple inspection of the abdomen may show enlargement, retraction, and venous distention, if either of these conditions is present. Exaggerated contraction is noticeable through the abdominal walls. When there is undue relaxation the belly flattens out when the patient is on his back, and falls downward like a half filled sack when the patient stands (enteroptosis).

Palpation should be done in a warm room, and in some instances a relaxation of the abdomen is best secured by placing and examining the patient in a warm bath or anæsthetizing him. Palpation elicits a gurgling sound and a splashing sound over the stomach or colon. Tumors are intraperitoneal and extraperitoneal, and phantom tumors can be indented by pressure. Where there is inflammation, pain or tenderness is elicited on pressure and also a feeling of resistance when the parts are lax.

Palpation of the appendix and incidentally the kidneys is readily possible. These organs can be felt in children and adults in most cases in which a careful search is made.

Percussion is less important than palpation. A distended gut gives a tympanitic sound; a collapsed gut or one filled with liquids or solids shows dulness. An abdominal effusion changes its position with the changed position of the patient, unless it is encysted or confined by adhesions.

Auscultation reveals undue or absent peristalsis and the gurgling and splashing sound, but furnishes no valuable data otherwise. The *rectum may be explored* by the finger protected by a finger cot, or by means of a speculum and light.

Transillumination after a cleansing enema has little practical value.

An x ray examination of the lower gut can be made with the aid of a wire encased in a soft rectal tube, which can be inserted up to the sigmoid flexure, or by means of a high injection of starch water in which subnitrate of bismuth is suspended. Such a fluid will gravitate to the colon in the dorsal posture with the hips elevated.

Inflation of the lower gut by means of an inverted siphon or by injecting air with a bicycle pump is easily accomplished. An inflated colon will lie *in front* of a kidney tumor or retroperitoneal glands and *behind* or below an enlarged spleen. The colon can be inflated by gas, water, or oil in the genupectoral position. (See also Laboratory Diagnosis.)

Examination of the Fæces.—The quantity, consistence, and character of the fæces vary. In the small intestine the stool is liquid; its consistence and form are attained in the colon. If there is rapid peristalsis or increased secretion in the colon, the stools are also liquid. Decreased secretion will favor dry stools. In chronic constipation the stool forms into small scybala. Spastic constipation or stricture may furnish a small calibre stool. The color is influenced by what has been taken into the stomach (iron, bismuth, blackberries, etc).

Gmelin's bile reaction is not found in the fæces normally. When found it indicates a disturbance in the small intestine and rapid peristalsis. Gray stools indicate an absence of bile in the intestinal tract, but it should be borne in mind that gray stools are also observed in tuberculosis of the intestines, in leucæmia, and in carcinosis. Vegetables and milk give an abundant stool. The reaction of the fæces is alkaline except in fermentative diarrhœa. Lientery is that condition in which remnants of food or fat or starch are found in the stools. Starch in the stool in *considerable quantities* is always pathological. We may find in the stool *remnants of food*, found in every stool (starch rarely); *fragments of tumors* and *tissues* (carcinoma, dysentery); *concretions*—enteroliths, coproliths, gallstones, foreign bodies; *pus* in abscess, dysentery, or syphilitic, tuberculous, or carcinomatous ulceration; *blood*, in injury, endarteritis, infection, intoxication, congestion from disturbed circulation, hæmorrhoids, and ulceration. When small quantities of blood are found in the stools of typhoid fever patients, we should be on the lookout for profuse hæmorrhages. Blood from the stomach or duodenum is usually black or tarlike.

Mucus may be of vegetable origin and resemble frog spawn. It is usually the product of irritation and catarrh of Lieberkühn's glands. No mucus, no catarrh. Colica mucosa is observed in neurotics. Yellow mucus (bile) means catarrh of the small intestine (duodenal catarrh). Mucus in the stools may indicate constipation, piles, enteroptosis, worms, intestinal adhesions, or nervous colic.

Fibrin.—Membranes in the stools are generally mucus. Erhlich's triacid solution colors mucus green, fibrin red. (See Laboratory Aids.)

Fat is always found in drops or crystals. Large quantities are found in defective absorption, in fat diarrhœa of children, and in hepatic and pancreatic disease.

Bile.—Normally there is no bile reaction in the stools. When it is present it indicates catarrh of the small intestine. The stools of children colored green by bile resemble "green bacillus" stools.

Parasites.—Worms, protozoa, amœba.

Crystals.—The so called Charcot crystals speak for worms in the intestine.

Bacteria.—In the present state of our knowledge no exact clinical deductions can be drawn from the enormous number of bacteria found in the stools, except when cholera, typhoid, tuberculosis, or bubonic microbes, etc., are found.

For careful investigation of the stools the employment of a stool sieve is necessary. (See Laboratory Diagnosis.)

For lavage, flushing the colon, and enteroclysis, see chapter on General Therapeutics.

CONCLUSIONS

It is admitted by the majority of clinicians that a chemical examination of the stomach contents is of minor practical importance as compared with a good insight into the motor function. To rely upon secretory phenomena in forming a diagnosis, prognosis, and treatment is a grave mistake. The early recognition of organic stomach disease is of great importance, and in long standing dyspepsia with considerable loss of weight and in the absence of a palpable tumor or stricture an examination under narcosis or an exploratory laparotomy is justified.

The introduction of a stomach tube is usually contraindicated in the advanced stages of heart disease, in aneurysm, pulmonary hæmorrhage, advanced cachexia, pulmonary tuberculosis, apoplexy, cerebral hyperæmia, and ulcer of the stomach with recent hæmatemesis and dark stools, or when the stomach mucosa easily bleeds.

In summing up, we may state that the gastroenteric tract has a triple function: Mechanical, chemical, and absorptive. Any disturbance of these functions is followed by a simple or inflammatory dyspepsia and malnutrition. Fermentative and putrid changes in the mouth may travel into the stomach and intestines. It is of importance to know whether a disturbance of digestion is due to infection or motor disturbance or is of neurotic origin, and it is important to remember that the susceptibility to infection and catarrhal conditions of the gastroenteric tract is different in different individuals, and thus we have clinically *weak* and *strong stomachs*.

CHAPTER VIII

THE DIGESTIVE SYSTEM—*Continued*

GASTROINTESTINAL AILMENTS IN ADULTS

SYNOPSIS: Acute Dyspepsia and Gastritis, Diet, Medication.—Chronic Dyspepsia with and without Dilatation and Atony, Varieties, Specimen Diet, Treatment.—Dyspepsia of Pregnancy.—Secretory Neuroses of the Stomach.—Erosion and Ulcer of the Stomach, Clinical Varieties of Ulcer.—Cancer of the Stomach.—Benign Tumors.—Hæmorrhage from the Stomach.—Gastrointestinal Neuralgia, Cardialgia, Gastralgia, Enteralgia, Colic, Stomach Cramps, Differentiation, Treatment.—Indications for Operation of the Stomach.—Constipation and Fæcal Impaction.—Fæcal Tumors.—Diarrhœas and Incontinence, Clinical Forms.—Tympanites and Dilatation of the Colon.—Inflammatory Disorders of the Intestines, Acute and Chronic.—Enteritis.—Gastroenteritis and Dysentery.—Dysentery.—Ulcer of the Intestines.—Appendicitis, General Indications for Operation.—Neoplasms of the Intestines.—Bowel Obstruction.—Hæmorrhage from the Intestines.—Remarks on Strangulated Hernia and Taxis.—Intestinal Parasites.—Hook Worm Disease.—Enteroptosis.—Intestinal Indigestion, Treatment by Diet, Exercise, Baths, Medication.

ACUTE DYSPEPSIA ; ACUTE INDIGESTION ; GASTRICISMUS

Ætiology.—The disease is due to dietetic imprudence, overeating, unsuitable or decomposing food or abuse of alcoholic beverages.

Symptoms.—Headache, a dull feeling, epigastric fulness, dull pain in epigastrium, nausea, eructations, vomiting, coated tongue, fœtor ex ore, a bad taste in the mouth. The attack may last from two to five days. Constipation or diarrhœa may be associated with acute dyspepsia.

Treatment.—DIET.—Carbonated water, slimy soup, meat broth or beef tea, peppermint tea or black tea, or total abstinence from food for from twelve to twenty-four hours.

MEDICATION.—Five to ten grains of calomel followed by a saline cathartic, and on the following day five drops of dilute hydrochloric acid in sugar water, four times a day, and a long walk in the fresh air.

Prognosis favorable. (For acute indigestion in children, see Pædiatrics.)

Acute Gastritis, Simple, Phlegmonous, Toxic, Infectious, Parasitic

This is the severe form of acute dyspepsia. There are, in addition to the ordinary symptoms mentioned above, pain, tympanites, high colored, scanty urine, and occasionally slight jaundice. The management is the same as in ordinary acute indigestion, but a strict diet will have to be kept up for a longer period, and in addition the following prescription is very serviceable to control pain and vomiting in adults:

℞ Morph. sulph.,	gr. j;
Aquæ amygd. amar., Tinct. valerian, æther., } āā,	ʒj;
Aquæ carbonicæ, ad,	℥v.

M. S.: One half to one tablespoonful every two hours. Keep on ice. Do not shake the bottle.

In some cases morphine should be given hypodermically.

In addition to simple acute gastritis, there are the *phlegmonous gastritis* secondary to cancer or septic peritonitis and other processes, *toxic gastritis* from the ingestion of corrosive poisons (see Poisons), *infectious gastritis*, which is observed during severe infectious disease (scarlatina, etc.), and a *parasitic gastritis, or mould in the stomach.*

Prognosis.—The prognosis of all forms of severe gastritis will depend upon the underlying cause. In the very young and the aged or in cachectic individuals the prognosis is very grave.

Treatment.—The treatment is symptomatic, as in acute simple gastritis.

CHRONIC DYSPEPSIA

Dyspepsia, although only a symptom indicating a disturbance of some kind, rises in practice, like convulsions, to the dignity of an ailment. The laity invariably associate the symptom "dyspepsia" with the stomach proper, and thus the stomach specialist may bask in the sunshine of all the ills that flesh is heir to, because all sickness is accompanied more or less by dyspepsia or a loss of appetite.

It is the duty of the physician to make a careful clinical examination of his patient in long standing dyspepsia, and after excluding heart, lung, kidney, liver, brain, and nerve disease, he will finally come by exclusion to the consideration of a primary dyspepsia having its origin in some disorder of the gastroenteric tract, and our modern methods of examination will enable him to tell whether he has to deal with an inflammatory or secretory disturbance or a motor insufficiency (muscular or stenotic) or ulcer or new growth.

When dyspepsia is secondary to, or concomitant with, other organic disease, our efforts to overcome dyspepsia will be futile unless we recognize and direct our therapeutic efforts to the primary ailment. We must always bear in mind that chronic indigestion must be viewed *in its relation to the whole gastroenteric tract, and not in relation to the stomach alone.*

Clinical Varieties of Chronic Dyspepsia

Chronic Gastric Catarrh.—The primary causes of this ailment are dietetic errors and the excessive use of alcoholic beverages. It may be secondary to any chronic constitutional or organic disease of the heart, lungs, liver, kidneys, etc.

SYMPTOMS.—There may be general malaise, coated tongue, bad taste in the mouth, metallic taste, headache, vertigo, fickle appetite, epigastric oppression after eating, or "heartburn," local tenderness, eructations of bitter fluid, belching of gas, tympanites, vomiting after meals, morning vomiting or dry retching of watery mucus in alcoholism. Constipation and diarrhœa may alternate. Palpitation of the heart is common, and a "stomach cough" is generally due to chronic pharyngitis. The urine is usually high colored and shows a heavy deposit.

An examination of the stomach contents enables us to recognize three forms of chronic gastritis:

1. *Simple Chronic Gastritis.*—HCl diminished. Fasting stomach contains a little slimy fluid.

2. *Mucous Gastritis.*—HCl diminished. Large amount of mucus present.

3. *Atrophic Gastritis.*—HCl and pepsin absent. Fasting stomach empty. The symptoms of atrophic gastritis resemble those of cancer (tumor absent) or pernicious anæmia and are accompanied by pain, vomiting, and progressive emaciation.

The PROGNOSIS of chronic gastric catarrh is good, but it will take time to effect a cure. If atrophy has taken place, the prognosis is unfavorable.

TREATMENT.—When the diagnosis of chronic gastric catarrh is made, the patient may take one dose of podophyllin as follows:

℞ Podophylli, ... gr. ⅓;
Calomel, ... gr. x;
Pulv. aromat., ... gr. iij.
M. Sig.: Take at bedtime.

Every morning before breakfast the patient should sip a cup of *hot water* in which is dissolved a teaspoonful of Carlsbad salt in case of chronic constipation. Should the Carlsbad salt not agree with the patient, an enema or a "lapactic" pill may be taken before going to bed. As a rule cases of chronic gastric catarrh do not improve unless the bowels move freely once a day.

SPECIMEN DIET

On rising, one cup of hot water.

8 A. M., one bowl of slimy soup with or without egg, or two scrambled eggs with toast, or two raw eggs with salt, tea, toast, zwieback. Avoid fats.

11 A. M., one cup of bouillon with egg or eat a piece of sweet chocolate.

12 to 1, plain soup or bouillon, raw scraped meat or lamb chop or scrambled eggs, fresh green salad, rice, stewed fruit, and tea.

6 P. M., cold meat, beef, chicken, turkey, raw ham, raw oysters, caviar sandwich with lemon juice, raw meat sandwich, meat jelly, salt sardelles, buttermilk, tea, cocoa, toast, etc.

Milk or buttermilk may be taken with any meal if it agrees. Hydrochloric acid will aid digestion if taken after each large meal. HCl may be given in water or in combination with essence of pepsin or with bitter tonics (see General Therapeutics). Occasionally HCl will not agree, and then it will be well to give the following alkaline powder after eating:

℞ Bismuth. subcarb., } āā, ... gr. v to x.
Magnes. ust., }

Beer should be forbidden. A glass of Rhine or Moselle wine or a teaspoonful of whiskey in water after meals may be allowed as an experiment. At the same time the patient should have exercise (walking, bicycling, punching bag, horseback riding), and should be free from worry; if necessary, he should go away from home to secure it. General *mild massage* and *vibratory massage of the stomach* are very important adjuvants to the treatment, also *warm baths* or *cool douches*. As the patient improves, the diet may be more liberal, *avoiding* dense cheese, fried potatoes, fatty sauces, cabbage, beans, mayonnaise, beer, pastry, and raw fruit. Contrary to universal prejudice, the writer has only occasionally found it necessary to eliminate from the diet *salt pickles*, *green salads*, and *soft mature cheese*.

When such management fails to improve the patient, stomach washing is indicated, particularly *in cases with much mucus in the stomach*. Two to three quarts of warm water containing half an ounce of bicarbonate of sodium are used. The best time to wash the stomach is one half to one hour before breakfast. Stomach washing may be continued for from two to six months. (See General Therapeutics.)

DYSPEPSIA WITH DILATATION OR ATONY OF THE STOMACH

There are three varieties of stomach dilatation: 1. *Acute dilatation*. 2. Dilatation due to *stricture* or narrowing of the pylorus or duodenum, malignant or non-malignant. 3. Dilatation due to *chronic gastric catarrh* or habitual overdistention (beer drinkers, overfeeding of infants) and degenerative changes from wasting disease.

Symptoms.—Anacidity, hyperacidity, and normal acidity may be associated with dilatation. In addition to ordinary dyspeptic symptoms, we notice a characteristic vomiting of large quantities of stagnant fluid. The vomit is acid, from the presence of lactic, butyric, and acetic acids, and offensive to the smell. The fluid contains particles of food, the *Sarcina ventriculi*, yeast fungus, and bacteria. Auscultatory percussion and inflation by air or transillumination will determine the outlines of the stomach, and a splashing and succussion sound may be elicited by the hand.

Finding a tumor will decide against the atonic nature of the dilatation, and in the majority of cases the tumor is cancer. The distinction of benign from malignant tumor can be made only by operative inspection.

The **prognosis** depends upon the cause.

Treatment.—In atony due to stricture at the outlet of the stomach operative interference is the only help. If the stricture cannot be removed, the stomach may be joined to the intestine (gastroenterostomy). In the atonic variety lavage, enemata, a dry diet, and vibratory massage are the important elements of treatment. As myasthenia is not uncommon in students and persons leading a sedentary life, an active out of door life should be encouraged. In enteroptosis an abdominal binder should be worn.

SPECIMEN DIET FOR DILATATION

Scraped meat, scraped ham, smoked beef, game, fowl, soft eggs, cereals (all kinds) and cream, beef, or meat jelly, extract of malt, boiled beef, oysters, raw or stewed, purée of potatoes, lentils, peas, omelette soufflé, zwieback, crackers, toast, caviar, cocoa, chocolate, tea, tropon, Tokay or Malaga wine, whiskey in teaspoonful doses in water.

Other articles may be selected from the general diet lists. The amount of liquids taken should not exceed three pints in twenty-four hours. In some instances rectal feeding becomes necessary for a time, particularly in severe vomiting and pain.

MEDICATION.—Hydrochloric acid or tincture of nux vomica is to be given after eating. Morphine subcutaneously may be necessary in extreme cases with excruciating pain. Strychnine in dilute phosphoric acid, gr. 1 ad ℥j, ten drops three times a day, is useful. Massage and vibratory massage and hydrotherapy (cold douche or spray to the region of the stomach) are of great importance. Some patients do well by wearing a moist towel around the abdomen day and night (Neptune's girdle), and in other cases an abdominal bandage gives comfort and relief.

OPERATIVE TREATMENT.—In otherwise incurable simple atonic dilatation excision of a part of the stomach wall (gastroplication, or gastrorrhaphy) has been done. Before operating upon the stomach proper, we should be absolutely certain that the obstruction to the flow of chyme is not somewhere *outside* of the stomach.

CHRONIC NERVOUS DYSPEPSIA

Nervous dyspepsia is a generic name covering sensory, motor, and secretory neuroses. Neurasthenic individuals generally have some special organ which gives them particular trouble. The stomach neurasthenic has many or all of the symptoms enumerated under dyspepsia, and is a hypochondriac in addition. But in spite of these symptoms the *stomach is found to be empty six or seven hours after a full meal, showing that there is no stagnation in the stomach.* The gastric juice is usually normal, but it may be increased or diminished. In nervous dyspepsia there is very little epigastric tenderness, and usually a powerful throbbing of the abdominal aorta, particularly in women, is noticed.

Diagnosis.—The diagnosis rests upon a recognition of the existence of a *neuropathic constitution* and the *absence of organic disease.* The distinction of nervous dyspepsia from ulcer becomes difficult only in those cases in which *there has been no vomiting of blood.* In ulcer gastric pain is regularly dependent upon eating, and there are circumscribed pain points in the epigastric region and in the back. In chronic gastric catarrh there is much vomiting of mucus, occasionally blood streaked. In cancer the distress is present, with and without food in the stomach, and HCl secretion is usually absent.

Prognosis.—The prognosis in nervous dyspepsia is favorable.

Treatment.—Correct bad habits, hunt up and remove the underlying cause, such as floating kidney or enteroptosis (abdominal binder). Enjoin rest from mental and bodily overwork, urge change of environment and employ gymnastics, general massage, and static electricity. Stomach washing is not indicated in nervous dyspepsia.

Diet.—There is no orthodox diet for nervous dyspepsia. A liberal mixed diet is to be advised, avoiding cabbage, pastry, rich dressings, beans, pears, fried oysters, and clams. A purely liquid diet and peptonized food are to be condemned for this class of cases. As regards diet, the statement must be most emphatically reiterated that no ironclad rules can be given. A fluid diet is to be avoided if possible, and the patient's tastes and idiosyncrasies are to be taken into consideration. It is a better plan to start with a liberal miscellaneous diet, and gradually eliminate articles which disagree, than to start with fluid or peptonized food and gradually build up. The bowels should move daily. If the tongue is coated, half a teaspoonful of Horsford's acid phosphates may be taken in water after meals or five drops of dilute hydrochloric acid. In insomnia chloral and bromide of potassium will be necessary occasionally at bedtime. Some neurasthenics sleep well if they take beer or porter with a salt cracker before going to bed. Nervous dyspeptics must understand that the "heart thumping" is not heart disease. In fact, "mind cure" applied with tact will work wonders. In some instances a Weir Mitchell rest cure is advisable.

The **Dyspepsia of Pregnancy** is partly neurotic and partly due to circulatory disturbances. Vomiting is best controlled by chloral hydrate and bromides. HCl after eating and general hygienic management are indicated.

SECRETORY NEUROSIS OF THE STOMACH

The terms *supersecretion*, *hyperacidity*, *anacidity*, *gastrosuccorrhœa*, and *achylia gastrica* are employed to denote certain anomalies of secretion as observed in the modern analysis of stomach contents. Such disturbances are functional without discoverable local lesion. They may be of reflex origin, they may be temporary or more or less permanent, they may exist with and without indigestion, and they cannot be identified with any uniform or characteristic symptom group. Such manifestations will receive brief mention with the distinct understanding that they *must not be looked upon as a separate, tangible disease but simply accepted as "conditions."*

Dyspepsia with Hyperchlorhydria (Hyperacidity)

One hour after Ewald's breakfast the stomach contains an excess of HCl (free HCl). Three to four hours after a meal the meats are found digested, the starchy food is almost unchanged. This condition may show periodically or be continuous.

Symptoms.—Cardinal Symptoms.—Burning pain two to three hours after eating, and hyperacidity.

Points in Differential Diagnosis.—In *gallstone colic* the pain is more in the right hypochondrium and is not relieved by alkalies or food. In *gastric ulcer*, which is also accompanied by hyperchlorhydria, there is bloody vomit with no complete relief from alkalies. There is increased pain from food. In *supersecretion* we find a large amount of gastric juice in the fasting stomach.

Treatment.—Wearing of an abdominal support. General hygienic management of dyspepsia with hyperacidity.

Diet.—A generous diet with *proteids in excess is indicated theoretically.* However, some cases do remarkably well on a diet in which there is a preponderance of cereals and fat (cream). Start with a liberal miscellaneous diet and gradually eliminate whatever is found to disagree. Beer, fresh bread, pastry, cabbage, raw fruit, and fresh oysters usually disagree.

The medication is alkaline. Bismuth, with or without morphine, bicarbonate of sodium, magnesia, and alkaline waters. The bowels must move freely. Lavage may be necessary.

Other Forms.—*Dyspepsia and continuous or periodic supersecretion* of gastric juice in the fasting stomach have been recognized. The attacks come on with vomiting of acid or greenish gastric juice and pain, headache, pallor, and constipation. Before we stamp it as a pure neurosis and treat it as such (see Hyperacidity), we must exclude the gastric *crises of locomotor ataxia* and *gastric ulcer.*

Dyspepsia and Hypochlorhydria and Achylia Gastrica.—Absence of HCl is noticed in cancer of the stomach and in atrophic gastritis. When the ferments are also absent, the term *achylia gastrica* has been used by Einhorn, of New York. An examination of the stomach contents will reveal the actual condition present. The administration of HCl is indicated after each meal.

EROSIONS AND ULCER OF THE STOMACH

Peptic ulcer, duodenal ulcer is most common in women between twenty and thirty years of age and is often associated with chlorosis, overwork, and hepatic and cardiac disease. Arteriosclerosis predisposes to gastric ulcer. Duodenal ulcer has been observed in infants.

Symptoms.—Dyspeptic symptoms with localized pain and vomiting of blood, grave anæmia, loss of weight, and hyperacidity are the characteristics of gastric ulcer. The pain is burning and acute and made worse by pressure and food. Hæmatemesis occurs in 50 per cent of the cases. In duodenal ulcer there are localized pain, occasionally blood in the stools, anæmia, and loss of weight.

Termination and Prognosis.—Gastric and duodenal ulcer may terminate by healing, it may perforate and cause peritonitis, it may lead to death by inanition or hæmorrhage, or it may heal with cicatricial contracture and cause obstruction. The prognosis is therefore to be guarded.

Clinical Varieties of Ulcer.—1. Light attacks with pain, hyperacidity, pyrosis, no hæmatemesis; 2. Severe attacks with hæmatemesis; 3. Old chronic latent and relapsing cases with occasional hæmorrhage.

Differential Diagnosis.—*Cardinal Symptoms of Ulcer of the Stomach.*—Dyspepsia, cardialgia, hæmatemesis. If hæmatemesis is absent, the diagnosis may be very difficult. In simple gastralgia vomiting of blood is absent and the taking of food gives relief from pain. Dyspepsia is usually not marked between the attacks of pain. Emaciation is moderate and circumscribed tenderness is absent. In the gastric crises of tabes there is absence of the knee jerk, with lightning pains in the legs, and the Argyll Robertson pupil. Hepatic colic shows swelling and tenderness of the liver and frequently jaundice. Hepatic cirrhosis with hæmatemesis may simulate ulcer, but will show a hard, enlarged liver and ascites. Chronic gastritis shows moderate pain, rarely hæmatemesis, and rarely hyperacidity. Cancer of the stomach shows tumor, absence of HCl, and coffee ground vomit. Cachexia usually occurs in older people. In palpable cicatricial contraction near the pylorus the differential diagnosis without laparotomy is impossible; moreover, cancer may develop on the site of an old ulcer. Duodenal ulcer gives about the same symptoms as peptic ulcer. The violent pain is often associated with tarry or bloody stools. Occasionally there is jaundice.

Treatment of Gastric and Duodenal Ulcer.—Absolute rest in bed.

DIET.—Milk, cornstarch pap, slimy gruel, burnt flour soup, tropon in peppermint tea, beef jelly, white of egg, custard, water ices, cream, and condensed milk.

In the convalescent period, after four weeks, add scraped beef, sweetbreads, and farinaceous puddings. Rectal alimentation may be required.

MEDICATION.—Bismuth, gr. xxx, t. i. d., with or without opium, or morphine subcutaneously, gr. ¼ to ½.

To check vomiting, cracked ice should be given and small doses of opium administered.

Feeding by gavage may be necessary to overcome vomiting.

Lavage will check obstinate vomiting.

Surgical treatment may be necessary in the event of perforation, collapse, or peritonitis or for the purpose of excising the ulcer. Before surgical interference is attempted, the patient should have the benefit of the doubt and *undergo antisyphilitic* treatment, inasmuch as syphilis of the stomach has received positive recognition post mortem and should not be forgotten clinically.

CANCER OF THE STOMACH

This is generally primary, but may be secondary to cancer of neighboring organs. It is seldom observed before the age of forty and is decidedly a disease of old age. At the present time we look upon cancer as of parasitic origin, but we have as yet no proofs to that effect.

Location.—Pylorus, cardia, and small and large curvatures. Metastatic propagation to neighboring organs is common. Perforation and peritonitis may occur.

Prognosis and Duration.—Cancer is fatal in from one to three years.

Symptoms and Differential Diagnosis.—The CARDINAL SYMPTOMS are: Loss of appetite, dyspepsia, pain, vomiting (coffee grounds), dilatation, if at the pylorus, absence of HCl, presence of lactic acid, tumor, progressive emaciation, and anæmia.

The symptoms will vary according to the location of the lesion. Deglutition will be difficult in obstruction of the cardia. Cancer of the lesser curvature may progress without pain or vomiting. Cancer of the pylorus, or large curvature, will give typical symptoms and in many instances a palpable tumor. Palpation for tumor or undue resistance of infiltrated tissue is unsatisfactory in many instances for various reasons. In doubtful cases an examination under narcosis or an exploratory laparotomy is indicated. Transillumination and x ray shadowgraphs will aid in diagnosis.

Differential Points.—The following conditions may simulate cancer of the stomach: *Chronic gastritis.* No tumor, no vomiting of material like coffee grounds. *Gastric ulcer,* with and without pyloric thickening. Tumor rare. HCl in excess. *Pernicious anæmia.* No tumor, great reduction of the red cells. *Cancer of the pancreas.* No coffee ground vomit, HCl present, fat in the stools. *Cancer of the colon, and of the duodenum.* No coffee ground vomit, HCl present. *Movable kidney.* No coffee ground vomit, no cachexia, HCl present, characteristic shape of a palpable tumor. *Impacted fæces.* Disappears under treatment. *Cancer of the liver or gall bladder.* No coffee ground vomit, HCl present. *Tumor of the abdominal wall.* Extraperitoneal, no gastric disorder. *Tumor of the omentum* (tuberculous or malignant), no characteristic gastric symptoms.

In the presence of so many possibilities an exact diagnosis may require weeks of observation unless an exploratory laparotomy is performed.

Treatment.—Operative interference may relieve urgent symptoms, but will not cure the patient. *Pylorectomy* should be performed as early as possible. *Gastroenterostomy* will facilitate the transfer of chyle. *Gastrostomy* will permit the patient to be nourished through a gastric fistula. To relieve pain, morphine or chloral hydrate is to be administered. A liquid or soft diet will give the least distress, and stomach lavage may afford temporary relief.

SYPHILIS OF THE STOMACH

This may be of the ulcerative, diffusely sclerotic, or gummatous form. Nothing abnormal can be detected on physical examination. Pain and vomiting are the only symptoms; therefore the diagnosis rests upon the therapeutic test, and the treatment is self evident.

BENIGN TUMORS OF THE STOMACH

Tumors, such as polyps, lipomata, myomata, lymphadenomata, cysts, gastroliths, and foreign bodies in the stomach have been observed and might call for operative measures.

Non-malignant hypertrophic stenosis of the pylorus may occur in adults and infants (see Pædiatrics) and give all the symptoms of cancer, except vomiting of blood. The benign stricture is recognized as such at the time of operative interference. Before operative treatment is carried out the patient should undergo antisyphilitic treatment with the hope of overcoming a syphilitic tissue hyperplasia, which may involve any organ of a syphilitic patient.

HÆMORRHAGE FROM THE STOMACH

This ailment in infants is discussed in the Pædiatric Section. The blood vomited by adults may be red and fluid or like coffee grounds, and is often mixed with food. In hæmoptysis the blood is bright red and frothy and is *coughed up.* In large hæmorrhage into the stomach death may take place in a very short space of time, and only an autopsy will show the cause. Moderate bleeding from the stomach may be due to various causes, viz.: Swallowing of blood from the nasopharynx, injury, vicarious menstruation, gastric ulcer, gastric cancer, portal obstruction, hepatic and cardiac disease, the hæmorrhagic diathesis in acute or chronic illness and constitutional disease or hæmophilia.

Prognosis.—Hæmorrhage from the stomach is rarely fatal.

Treatment.—The treatment of hæmorrhage from the stomach for the time being is symptomatic. It includes absolute rest in bed, an ice bag to the stomach, opium by the mouth, ergotine hypodermically (gr. 2 pro dosi), also suprarenal extract, ice by the mouth, a ligature around one or two extremities, subcutaneous saline infusion in collapse, and surgical measures in ulcerative conditions.

GASTROINTESTINAL NEURALGIA (CARDIALGIA, GASTRALGIA, ENTERALGIA, COLIC, "STOMACH CRAMPS")

Pain in the abdominal region may be purely a neurosis. It may be due to overdistention and constipation, or it may be a symptom of organic disease, such as cancer, ulcer, intestinal tuberculosis, strangulation, or appendicitis, or it may be a familiar manifestation of tabes dorsalis (painful crises). The possibility of gallstone, lead, and renal colic in hypogastric pain should not be overlooked, particularly in the absence of jaundice, and in some cases gastrointestinal adhesions are productive of paroxysmal pain. Uterine and ovarian colic are often called stomachache. Grief, worry, overwork, anæmia, malaria, arteriosclerosis (arteriosclerotic bellyache), syphilis, gout, and neurasthenia are predisposing factors in gastrointestinal neuralgia. The pain is of varying character and often accompanied by a feeling of faintness. Cardialgia begins in the epigastrium and radiates to the back, especially along the side of the stomach. It may last a few minutes or hours.

Differential Diagnosis.—The following points may be borne in mind: *Gastric crises of tabes* are associated with lancinating pains, Argyll Robertson pupil, girdle sensation, and absence of patella reflex. In *ulcer of the stomach* the pain comes on after eating and is confined to certain spots in the epigastrium. It is increased by pressure, and may radiate to the back. The vomit contains blood and a large amount of free HCl. In *perigastritis*, the sequela of ulcer, pain is not persistent and there is no vomiting of blood. In *duodenal ulcer* vomiting is infrequent. There is often blood in the fæces, and occasionally we notice jaundice. In *cancer of the stomach* there are pain and "black vomit." In *gallstone colic* the pain is more apt to radiate to the *right shoulder*. Frequently we observe jaundice, and often there is a chill with fever and swollen spleen, and pressure upward behind the ribs and behind the gall bladder elicits pain. The stools may be clay colored.

In *renal colic* the pain usually radiates into the pubic region, and the urine may show blood and small calculi.

Lead colic has a history of exposure to lead intoxication and the gums show a characteristic discoloration.

In *appendicular colic* palpation will find the appendix painful and swollen.

In *mucous colic* mucus and fibrinous shreds pass from the bowel.

Treatment.—When pain is severe the patient should rest in bed. If no relief follows the application of a hot water bag or mustard plaster, and the administration of hot tea or ten drops of Hoffmann's anodyne on sugar, a morphine injection (gr. ¼ to ½) should be given over the seat of pain and repeated if necessary. The following medicine is also very prompt in checking stomach pain:

℞ Chloroformi, ... ʒj;
Morph. sulph., ... gr. j;
Pulv. gummi arabici, ... ʒj;
Aquæ, ... ad, ℥iij;
M.: Ft. emuls. et adde

Syrupi, ... ʒjv;
Aq. amygd. amar., ... ʒj.
S.: ʒj every half hour until relieved.

After the attack of cardialgia is over we should look for the underlying cause and endeavor to prevent a recurrence.

The purely *neurotic form of gastralgia* is therefore recognized by exclusion, and for this class of cases a change of scene—outdoor exercise and abundant food—nux vomica and hydrochloric acid are indicated. Pain in the lower bowel may be eased by suppositories of opium and belladonna.

INDICATIONS FOR OPERATIONS ON THE STOMACH

Malignant disease should be operated upon at the earliest possible moment. *Non-malignant obstruction* to the flow of chyle should be operated upon, provided a long continued trial of out of door life combined with gymnastics and massage (also vibratory massage) and antisyphilitic treatment has failed to give relief.

Gastrotomy may be indicated for the purpose of direct inspection, for the removal of a foreign body, or for gaining access to a strictured œsophagus. A *gastric fistula* (*gastrostomy*) may be necessary for feeding in stricture above the stomach. *Gastroenterostomy* is indicated in otherwise "inoperable" strictures of the lower stomach and duodenum and in extreme atonic dilatation of the stomach. *Resection of the stomach* in part is done for the removal of diseased stomach tissue. *Gastroplication* is an operation devised for atonic dilatation of the stomach without stricture, after all other means have failed.

CONSTIPATION; OBSTIPATION; FÆCAL IMPACTION

Peristalsis carries off at regular intervals the waste products of digestion. Constipation is the opposite of diarrhœa. Two daily evacuations may be normal in some individuals, while others may normally have one movement every other day. According to the writer's experience, healthy individuals have on an average one movement a day. Retention of fæces produces local irritation and undue absorption of putrefactive poisons, resulting in malaise, dyspepsia, malnutrition, anæmia, etc. Primary anæmia may cause atonic constipation.

Causes of Constipation.—*Congenital malformations* or anatomical peculiarities, benign and malignant *strictures* of the pylorus, bowel, or rectum, *loss* or *excitability* of the mucous lining of the intestine, as in chronic catarrh, atrophy and adhesion following peritonitis, etc.

Degeneration of the *nervous apparatus* of the intestine is frequently called upon to explain constipation, but we have no definite knowledge on the subject. It is a fact, however, that constipation is frequently found in neurasthenics, melancholics, and persons suffering from diseases of the central nervous system. *Paresis* of a portion of the intestine is occasionally productive of constipation.

A *rigid sphincter* or *anal fissure* or painful *spasm* of the sphincter causes constipation. There may be atonic constipation from lack of secretion, from anæmia, from organic diseases, and from enteroptosis and flabby abdomen, which is common in women. In rhachitis we observe muscular atony of the bowel in children.

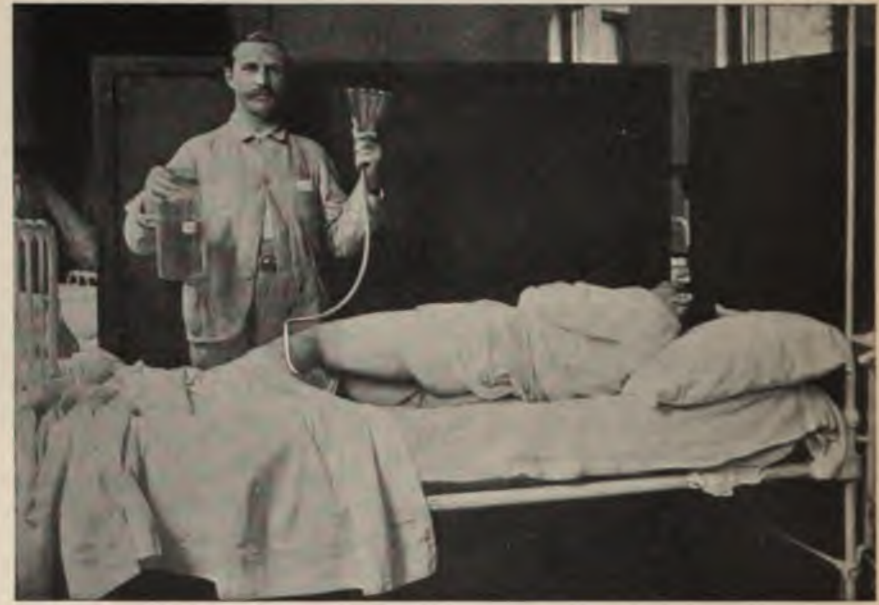

FIG. 109.—ENTEROCLYSIS.

We speak of spastic constipation with and without pain in neurasthenia and lead poisoning. We observe constipation from lack of moisture or lack of fat, or sugar, or from a one-sided diet (no vegetables, salads, or fruit), from negligence and irregularity, deferring visits to the closet, from lack of exercise and sedentary habits and occupation.

Constipation may be due to internal or external hernia, to invagination and intussusception, and to complete strangulation of the bowel, and in extreme cases bile and fæcal matter are vomited.

Treatment.—Temporary or accidental constipation as caused by a change of diet, etc., is overcome by an enema or a laxative drug. In chronic constipation we study the underlying cause and treat accordingly. Correct any faulty diet; increase vegetables, fruits, fats, liquids. Adults should sip slowly ¼ to ½ pint of cold or warm water morning and evening. Inculcate regular habits (also in children). Exercise in the fresh air, walking, riding, bicycling, tennis, golf, gymnastics, cold sponge bath, and shower baths. Massage of the abdomen. Automassage by means of a five to fifteen pound cannon ball rolled over the abdomen from right to left may be practised. Enemata of soap water by means of a fountain syringe and soft rectal tube or a piston syringe with a soft tube are useful, also suppositories of soap, glycerin, and gluten, dilatation of a rigid sphincter under narcosis, healing of anal fissures, and mineral waters, Vichy, Saratoga, Carlsbad (artificial Carlsbad salt in warm water), Hunyadi, Apenta, etc. *Laxative drugs:* Castor oil, croton oil, rhubarb, rhubarb and magnesia, compound rhubarb pills, effervescent citrate of magnesium, sulphate of magnesium, senna and manna, electuary of senna, compound licorice powder, tamar indien, compound infusion of senna with sodium sulphate, cascara with and without malt, aloes, St. Germain tea, calomel and jalap, podophyllin, strychnine and belladonna, lapactic pills, cream of tartar, Eno's fruit salt, iron and arsenic. An efficacious aloin pill is thus composed:

℞ Aloin,
Extr. nuc. vomic.,
Ferri. sulphat., } āā................ gr. ½.
Pulv. myrrhæ,
Pulv. saponis,

For spastic constipation warm aromatic high injections with oil are to be given.

Fæcal impaction in the rectum calls for manual aid. Complete obstruction demands timely surgical aid. Constipation in infants from lack of food (apparent constipation) may be remedied by proper feeding (see Pædiatrics).

When laxatives are given for any length of time, nature's remedies, *exercise* and *massage*, must not be neglected. In extreme cases of atonic constipation in children and adults the writer has known ten days to elapse before a movement resulted. In chronic constipation of children enemata may have to be given once daily for years, together with a laxative drug once a week.

In enteroptosis and constipation an abdominal supporter should be worn.

Stercoral, or fæcal, tumors are sometimes mistaken for true tumors and are sometimes overlooked. They give rise to various neuralgias by pressure on nerves, and frequently a hot burning feeling is complained of by the patient which radiates from the seat of the fæcal tumor in all directions. Persistent high enemas of soap suds and oil will remedy this condition.

Migraine and obstipation offer no uniform picture, but are of frequent occurrence. Laxatives, hydrotherapy, and physical and dietetic measures are to be employed.

DIARRHŒA AND INCONTINENCE OF FÆCES IN ADULTS

Diarrhœa is the opposite of constipation, and is usually due to increased peristalsis and supersecretion of the intestine. The principal cause of diarrhœa is an abnormal condition of the intestinal contents (spoilt food, gastro-enteric infection and intoxication), which may progress from a mild dyspeptic diarrhœa to catarrhal or ulcerative enteritis or choleraic diarrhœa. There is a psychic form of diarrhœa which does not have its origin in the intestine. We are all familiar with the intestinal noises and nervous diarrhœas of neurotic individuals. To this group belong the sudden diarrhœas of patients anticipating or dreading an examination or operation, etc. In all forms of diarrhœa the organism must suffer more or less, but a diarrhœa due to increased peristalsis of the large intestine (chronic diarrhœa due to rectal ulcer) is often tolerated a long time because of lesser absorption in the large intestine.

Diarrhœa may be acute or chronic according to its underlying causes. The most common cause is spoilt food (dyspeptic diarrhœa). Catarrhal or ulcerative enteritis causes inflammatory diarrhœa. Dyspeptic and inflammatory diarrhœa are not to be confounded with the *incontinence of fæces observed in the typhoid condition* or in central nervous disease.

Clinical Forms of Diarrhœa.—Dyspeptic diarrhœa in children from overfeeding or from spoilt food, erroneously attributed to teething (see Pædiatrics); dyspeptic diarrhœa in adults; acute nervous diarrhœa; paroxysmal mucous colitis (membranous diarrhœa); chronic nervous diarrhœa (as in tabes); diarrhœa from catarrhal or ulcerative enteritis due to microbial infection, such as cholera asiatica, cholera infantum, typhoid, tuberculous, syphilitic, or dysenteric ulcerations; symptomatic (dyspeptic) diarrhœa in acute infectious disease, septic conditions, chronic malarial disease, cardiac, pulmonary, renal, pancreatic, or hepatic disease, etc.; fat diarrhœa in infants and adults in hepatic and pancreatic disease; amœbic diarrhœa (so called) in which amœbæ are found in the stools; and morning diarrhœa, generally due to some organic ailment in the colon or rectum.

General Treatment.—The symptomatic management of diarrhœa in adults is exceedingly simple. In the mild forms temporary dieting will suffice, and we can aid nature by administering a good dose of castor oil to eliminate retained putrescible material. The diet should consist of burnt flour gruel or slimy soup and some farinaceous water or toast water, mint tea, or carbonated water to quench thirst. Should the watery discharges continue, the peristaltic sedatives and astringents are indicated. Opium may be administered, five to ten drops of the tincture for adults, given once or twice, or tannin, gr. v to x, bismuth, gr. x to xx, several times a day.

The return to the ordinary food must be gradual, and dilute HCl may be given to aid digestion. In children and adults flushing of the colon may be practised once or twice a day. Abdominal pain may be controlled by opium and belladonna suppositories and by applying a moist compress or hot water bag to the abdomen. Chronic diarrhœa due to ulceration in the lower bowel may require the establishment of a fistula and flushing of the bowel from above downward.

Diarrhœa secondary to other disease will be managed on the same lines, with due regard to the underlying conditions.

Mucous Diarrhœa, Mucous Colic, Membranous Enteritis.—This ailment is looked upon as a neurosis, and it occurs mainly in women of a neuropathic constitution, particularly in women with large bellies (enteroptosis) and rarely in children. Its purely neurotic nature is doubtful because mucous colic is often associated with follicular inflammation in the lower intestine. It manifests itself by the usual gastrointestinal symptoms, great nervous irritability, and painful and paroxysmal passages of mucus and membranes from the bowel, the attacks lasting from three to seven days. The membranes may be shreddy, ribbon-shaped, cordlike, or cylindrical. Emaciation and loss of strength occur in varying degrees, and numerous other conditions may coexist with this trouble. In making the diagnosis it is important to know that various substances may simulate membranes.

TREATMENT.—Liberal mixed food, no liquid diet, out of door exercise, cold douches, wearing an abdominal supporter, the hot water bag to the abdomen to relieve pain, or an occasional suppository. Morphine injections should be given only in severe pain, as neurotics are apt to acquire the morphine habit.

In the intervals between the attacks the patient is to receive every night, before going to bed, an enema of warm oil (ten to fifteen ounces), to be retained all night if possible. After the first week, the enema may be given every other night, and finally only once a week, until five to six months have elapsed. The patient should have a movement from the bowels every morning, and if necessary an enema of soap water may be given.

Incontinence of Fæces may be produced by paralysis or destruction of the anal sphincter from whatever cause. Sometimes it results from deep ulceration, benign or malignant, but more frequently it is the result of operations in the lower rectum, especially for fistula, when the sphincter is cut obliquely instead of at right angle (Gant).

TREATMENT.—We can cure but few cases, yet we are able to make most of these sufferers fairly comfortable, so much so that they can go about with their fellow men. This is accomplished by (*a*) plastic operation; (*b*) cauterization.

Plastic operation for the relief of incontinence resembles the operation for the repair of a badly lacerated perinæum. The ends of the muscle must be located, freshened, and sutured together with catgut. The operation must be repeated until the desired result is obtained.

Cauterization is best effected by deep burning of the mucosa in one or more places with the object of producing artificial stricture. The cauterizations should be at least six weeks apart, and should be repeated until sufficient contraction occurs to prevent leakage.

TYMPANITES AND DILATATION OF THE COLON

Meteorism is associated with many forms of acute and chronic illness and may be defined as an inflation of the intestines with gases—the various gases which form in the intestines or are swallowed (air) and are absorbed into the blood or find a ready or natural outlet by the mouth or the anus, provided the muscular elements are in good tone. Increased gas production lessened absorption, and insufficient expelling power are the causative factors of meteorism found in dyspepsia, enteritis, intestinal indigestion, typhoid fever peritonitis, obstruction, constipation, hepatic derangements, lead colic, rickets, and hysteria. Tympanites may impede the action of the diaphragm and heart and cause pain, dyspnœa, and collapse.

Symptoms.—The symptoms are distention, a tympanitic percussion sound, tenderness, and colic.

In tympanites from perforation the liver dulness is obliterated.

Treatment.—(*a*) Of the underlying cause; (*b*) Symptomatic.

Turpentine internally, enemata, hot stupes, and hot peppermint tea may be employed, also charcoal, bismuth, hydrochloric acid, ether, opium, massage of the abdomen, vibratory massage, and the introduction of a rectal tube or puncture of the intestine. In prolonged tympanites an out of door life and cold sponge baths are indicated. In colic and tympanites of children from too much milk, dilute the milk. In tympanites in typhoid fever, stop the use of milk.

DILATATION OF THE BOWEL, CONGENITAL AND ACQUIRED

Dilatation of the bowel may be due to obstruction of the bowel or chronic constipation and other causes, and in some instances no organic cause can be discovered (idiopathic dilatation). The distention of the abdomen and constipation are the most prominent features. The general health deteriorates. An autopsy in such cases reveals an enormous enlargement of the transverse colon and sigmoid flexure.

Prognosis.—The prognosis in these cases is unfavorable. Eighteen out of twenty-four cases reported are known to have terminated fatally.

Treatment.—This includes tonic hygienic management, the selection of proper food, mild abdominal massage, vibratory massage, laxatives, enemata, or suppositories, and the use of a rectal tube to remove the gas. In cases which do not improve under such treatment an exploratory laparotomy may be indicated.

ACUTE CATARRHAL ENTERITIS

Acute catarrhal enteritis in adults occurs primarily or is secondary to various ailments, and should be looked upon as an infection or intoxication due to putrid intestinal contents, decomposed food, or some irritant poison. It is a common trouble in hot weather when food is apt to spoil.

Symptoms.—These are diarrhœa, colicky pain, gurgling noises from gases, sometimes vomiting, a furred tongue, thirst, loss of appetite, scanty urine, and occasionally fever. The *duration* is from three to eight days.

Prognosis.—The prognosis is favorable. In rare instances an *apparently acute enteritis* may develop into peritonitis with effusion, meteorism, and a rigid abdomen. *Such cases are due to the perforation of a simple or tuberculous ulceration of the intestine or to the breaking up of a degenerated mesenteric gland,* or an embolic thrombosis in some mesenteric vessel.

Clinical Varieties.—*Duodenitis* is sometimes diagnosticated on account of the associated jaundice if the small intestine, jejunum and ileum, is the seat of inflammation. The stools are flocculent and contain undigested food, unchanged bile, and some mucus.

Colitis is characterized by marked pain, diarrhœa, tenderness over the colon, and souplike stools.

In *proctitis*, or *rectal catarrh*, there is painful tenesmus with mucus and pus in the discharges.

Treatment.—Rest in bed, evacuation of the bowels by castor oil (℥j) or a saline cathartic.

BLAND DIET.—Burnt flour soup, slimy soup, Vichy, tea, toast, peppermint tea with tropon, raw eggs.

MEDICATION.—Give five drops of dilute hydrochloric acid in water after eating. To stop pain, give from five to ten drops of laudanum. To check persistent diarrhœa, order ten grains of tannin or tannigen, with or without half a grain of opium, or this prescription:

℞ Bismuth. subnitrat., ... gr. xx;
Pulv. opii, ... gr. ss.

M. S.: One such powder twice a day.

To aid nature in eliminating foul material, we employ flushing of the bowels once or twice a day. (See General Therapeutics.)

ACUTE GASTROENTERITIS IN ADULTS; CHOLERA MORBUS

This is a common disorder in hot weather, and is to be classed as an infection or intoxication due to putrid or poisonous gastrointestinal contents and spoilt food and drink, such as canned goods, fish, shell fish, ice cream, milk, etc.

Symptoms.—The symptoms are the same as in acute enteritis, but in addition there is vomiting on account of the participation of the stomach.

Treatment.—As the physician is generally called after vomiting has set in, an emetic is seldom necessary. In some cases stomach washing will be indicated. The patient should rest in a cool room with an ice bag to the head, should have ice to quench thirst and subdue nausea and vomiting, and should not partake of food for the time being. Internally we give:

℞ Tinct. valer. æth.,
Solut. morph. magend., } āā, ... ʒj.
Aquæ amygd. amar.,

M. S.: Fifteen drops, in ice cold carbonated water, every hour until relieved.

Lavage of the bowel will aid nature in eliminating foul material.

DIET.—For the first and second days the diet will be the bland one mentioned above. When the patient is fully convalescent, he can return to the ordinary food.

Prognosis.—The prognosis is favorable *except in old and feeble people and infants*, who sometimes die in collapse.

CHRONIC ENTERITIS

This is usually a sequel of repeated attacks of acute enteritis or dysentery, but it may develop in consequence of obstruction to the portal circulation in chronic hepatic or cardiac disease and chronic malarial disease, etc.

Symptoms.—Diarrhœa is present, or diarrhœa alternating with constipation. The pain is not so severe as in the acute form. Mucus and undigested food are passed in the stools.

Differential Points.—An ailment running a course as a chronic enteritis may have for its underlying cause syphilis, tuberculous ulceration of the intestine, or tuberculosis of the peritonæum. A careful clinical investigation will finally locate the trouble. This involves, besides the usual inquiries, an examination of the stools, an examination per rectum, a record of the temperature for two weeks, and an examination of the blood.

Treatment.—The underlying cause must be treated in the first place. Rest in bed, a bland restricted diet (including gum arabic mucilage), and intestinal flushing are indicated. In malarial subjects quinine must be used; in syphilitic subjects, antisyphilitic treatment is indicated; in tuberculous subjects, an out of door life is demanded. When tuberculosis of the peritonæum is suspected, an exploratory laparotomy may furnish us a positive diagnosis and afford relief and cure to the patient if the tuberculous infection is not a general one. The symptomatic medication in chronic enteritis is with bismuth, tannin, and opium. If a local examination should show accessible ulceration in the lower intestine, local applications of silver nitrate are useful, followed by extract of opium (gr. ss) and extract of belladonna (gr. ss) suppositories. In otherwise incurable cases the intestine may be flushed from above downward by establishing a fistulous opening in the right flank.

DYSENTERY IN ADULTS

When an infection is localized in the lower bowel and is intense enough to produce much local inflammation, diarrhœa, fever, tenesmus with mucus, blood, and the passage of fibrinous membranes, we speak of membranous enteritis, or dysentery, which may occur sporadically or in epidemics. As dysentery is transmissible like typhoid fever, the patient should be isolated and the stools disinfected with lime or copperas.

Clinical Varieties.—1. Catarrhal dysentery. Duration about one week.

2. Amœbic, or tropical, dysentery. The amœbæ are found in the stools and there is a steady loss of strength and weight. Uncomplicated cases last from six to twelve weeks, with a tendency to become chronic and with hepatic abscess following.

3. Chronic dysentery. Distinguished from other forms of chronic diarrhœa by the tenesmus and bloody, mucoid stools.

Prognosis.—In the mild forms, recovery is the rule. The mortality varies according to the nature of the lesion and the vitality of the sufferer.

Treatment.—Rest in bed, a bland diet (see Diarrhœa), flushing of the bowels, simple and medicated, suppositories of extract of opium, gr. ½, to overcome pain and tenesmus, astringent medication.

The treatment and diet are practically the same as in catarrhal enteritis, but the local management is more energetic. Irrigation of the bowels must be practised two or three times a day. For irrigating we use boiled water, aromatic water (mint decoction), starch water, with or without opium, tannin water (5 to 1,000), alum water (5 to 1,000), ichthyol water, 1 per cent, or nitrate of silver solution, ʒj to a quart.

Quinine in watery solution, 1 to 1,000, is employed in amœbic dysentery. Astringent internal medication is not to be used in the acute stage, but is efficacious in the convalescent stage.

Bismuth subnitrat., gr. x to xxx, may be given three times a day, or tannin, gr. v to x, at the same intervals.

℞ Plumb. acet.,............................ gr. iij;
Pulv. opii,.................................. gr. ss.

Such a powder to be given three times a day. In some cases a daily dose of half an ounce of castor oil with ten drops of tincture of opium is followed by a cure.

INTESTINAL ULCER

Causes.—Ulceration in the intestines may result from a variety of causes, viz.: Injury, ulceration in enteritis, acute and chronic, in tuberculosis, in syphilis, in cancer, in typhoid fever (see Typhoid Fever), in thrombosis and embolism in heart disease and pyæmia, in stercoral ulcers from the pressure of hard fæcal masses, and by pressure and perforation from without inward. Duodenal ulcers have been observed in infants and adults.

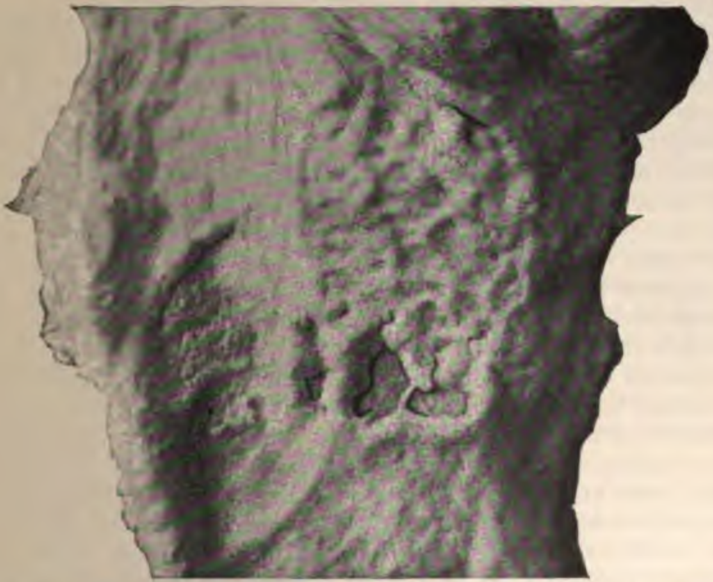

FIG. 110.—TUBERCULOUS ULCER OF THE ILEUM. (Nicoll, Archives of Pædiatrics.)

Symptoms.—Diarrhœa, bloody and tarry stools, pus and tissue, shreds in stools, colicky pain, and perforative peritonitis.

Diagnosis.—The differential diagnosis involves a lucid anamnesis and painstaking examination of the stools and of the lower intestine by means of the Kelly tube, if necessary under narcosis.

Prognosis.—The prognosis depends upon the underlying cause.

Treatment.—The treatment is specific, surgical, or palliative, according to the underlying condition. The diet, hygiene, and internal and local medication are discussed under Diarrhœa and Enteritis. The specific treatment involves an inunction cure (mercurial ointment) or mercury and iodide of potassium internally. The surgical treatment involves flushing of the bowel through a fistula established in the colon on the right or left side.

TUBERCULOSIS OF THE INTESTINE

This may be primary, but is usually secondary to pulmonary tuberculosis. As such, it is a fatal complication for which there is only palliative or symptomatic management.

APPENDICITIS

Diagnostic Palpation of the Appendix Vermiformis

In searching for the appendix the author adheres to the rules laid down by Dr. G. M. Edebohls, of New York, as follows:

"The examiner, standing at the patient's right, begins the search for the appendix by applying two, three, or four fingers of his right hand, palmar surface downward, almost flat upon the abdomen, at or near the umbilicus. While now he draws the examining fingers over the abdomen in a straight line from the umbilicus to the anterior superior spine of the right ilium, he notices successively the character of the various structures as they come beneath and escape from the fingers passing over them. *In doing this the pressure exerted must be deep enough to recognize distinctly, along the whole route traversed by the examining fingers, the resistant surfaces of the posterior abdominal wall and of the pelvic brim.* Only in this way can we positively feel the normal or the slightly enlarged appendix; pressure short of this must necessarily fail.

"Palpation with pressure short of reaching the posterior wall fails to give us any information of value; the soft and yielding structures simply glide away from the approaching finger. When, however, these same structures are compressed between the posterior abdominal wall and the examining fingers, they are recognized with a fair degree of distinctness. *Pressure deep enough to recognize distinctly the posterior abdominal wall, the pelvic brim, and the structures lying between them and the examining finger forms the whole secret of success in the practice of palpation of the vermiform appendix.*

"Proceeding in this manner, the appendix is recognized as a more or less flattened, ribbon-shaped structure when quite normal, or as a more or less rounded and firm organ, of varying diameter, when its walls have been thickened by past or present inflammation. When it is the seat of inflammatory changes, the appendix vermiformis is always more or less sensitive on pressure; the normal appendix exhibits no special sensitiveness on being squeezed.

"There are two useful landmarks in practising palpation of the vermiform appendix: McBurney's point and the line of the right iliac arteries. The origin of the appendix from the cæcum, whatever course its continuation may run, is almost uniformly at McBurney's point; hence the diagnostic value in appendicitis of pressure over this point. The iliac arteries are useful in a twofold way: firstly, because to feel their pulsation distinctly means that the fingers have reached the posterior abdominal wall; and secondly, because the normal appendix is very constantly found about a finger's breadth outside of the artery, on a line between the umbilicus and the anterior superior spine of the right ilium.

"A good guide in searching for the appendix is formed by the right common and external iliac arteries, the pulsation of which can be easily and plainly felt. The line of these vessels corresponds to a surface line drawn from the left of the umbilicus to the middle of Poupart's ligament. The appendix is generally found almost immediately outside of these vessels. At its base it is separated from the vessels by a space of from one half to one inch, while lower down in its course it generally crosses very obliquely the line of the arteries.

"Theoretically, two conditions mainly militate against the successful palpation of the appendix vermiformis after the method above described; practically, the difficulties offered by these two conditions amount to very little or nothing. I refer to the variable location of the appendix and to the fact of its common deep situation behind the cæcum.

"With the very rare exceptions of its situation *far* away from its usual site, the origin of the appendix vermiformis is practically always found at what is known as McBurney's point. In fact, it is this constancy of the situation of the appendix which gives its practical value to McBurney's point in the diagnosis of appendicitis. The tenderness elicited by extremely localized pressure at McBurney's point is due to the presence beneath the finger of the inflamed appendix."

Definition and Varieties.—*Appendicitis* is a disease of the vermiform appendix with catarrhal, ulcerative, perforative, and gangrenous stages. The clinical varieties are the *acute cases* and the *chronic recurrent cases.* Infection, tumefaction, and various degrees of strangulation of the appendicular blind sac appear to be the pathological explanation of appendicitis. In some families there is an hereditary predisposition to appendicitis. Edebohls maintains that chronic appendicitis is the chief symptom and most important complication of movable right kidney.

Symptoms of Acute Appendicitis.—Acute pain in the right lower abdomen which may radiate in various directions; pronounced tenderness in the right iliac fossa. McBurney's point (the centre of a line drawn from the anterior superior spinous process to the navel), pronounced tenderness of the appendix as elicited by palpation, nausea, vomiting, fever, accelerated pulse. Diarrhœa or constipation may be present. Leucocytosis is a fairly constant symptom. Suppuration is provable by an exacerbation of previous symptoms and increase in size of the tumor or swelling located at McBurney's point or in the lumbar region or elsewhere. Perforation of the appendix may be indicated by severe pain, great tenderness, and marked rigidity. Pronounced sepsis may be inferred from vomiting and rapid pulse and high fever.

DIFFERENTIAL POINTS.—In *renal colic and twists of the ureter* the pain radiates into the groin and testicle, and there is hæmaturia or hæmoglobinuria. Pain in the groin and testicle is sometimes observed in appendicitis. The urine should be examined for small calculi.

Indigestion and Enterocolitis.—No circumscribed tenderness. No rigidity. No tumor. No tenderness of the appendix on palpation.

Intestinal Obstruction.—Palpation of the appendix is negative.

Acute Cholecystitis or Hepatic Abscess.—Tenderness on pressure from below the margin of the ribs upward. No tenderness of the appendix on palpation.

Gallstone Colic.—Pain radiates to the back on the right side, and the appendix is free on palpation.

Salpingitis, oophoritis, and *ectopic gestation* are recognized by bimanual palpation of the pelvic organs, and the latter is denoted by menstrual irregularities.

Perinephritic abscess on the right side may arise from appendicitis, but is usually a complication following an operation for appendicitis. If it is independent of appendicitis, the appendix is not tender on touch.

Tuberculous peritonitis is a slow process; palpation of the appendix may be impossible.

Mucous colic gives its own characteristic symptoms, and the appendix is found to be free on palpation.

Coxitis.—In young children appendicitis has been mistaken for hip joint disease. As the appendix can readily be palpated in children, the differential diagnosis is not difficult.

Acute rheumatic myositis of the rectus abdominis muscle simulates appendicitis.

Typhoid fever is usually associated with right iliac tenderness. The Widal serum test will settle the diagnosis in most cases. In typhoid fever the onset is slow and roseola is generally observed. Seibert, of New York, has reported two cases of typhoid fever combined with appendicitis.

Influenza, pleurisy, pneumonia, malarial disease, herpes zoster of the twelfth intercostal nerve, and other infections which frequently begin with severe gastrointestinal symptoms cannot be mistaken for appendicitis by any one who has learned to palpate the appendix.

The **prognosis** is uncertain. Mild cases end in recovery, as do localized abscesses after an operation. Severe septic peritonitis cases will often prove fatal with or without an operation. We are unable to judge of the clinical severity of a case before an operation, and we are unable to give a reliable prognosis, and physician and surgeon therefore should co-operate in the management of a case.

Treatment.—GENERAL INDICATIONS FOR OPERATION:

1. In cases of *diffuse perforative appendicitis* an immediate operation is indicated. Exceptionally patients get well without an operation.

2. In cases of *acute appendicitis* the patients always need careful observation. If the pulse *has the tendency to stay high,* the indication for an operation is given.

3. In *mild cases,* when the patients are doing well, wait for the subsidence of symptoms and operate in the interval.

4. In case of doubt, the operation is better than waiting. After the first attack from which the patient recovers without an immediate operation the appendix should be removed. The appendix, once inflamed, must be looked upon as a diseased organ which is very apt to give repeated and more serious, even fatal trouble in the future. Chronic appendicitis is to be diagnosticated, not on subjective symptoms, but on objective signs. Unless, in cases of suspected chronic appendicitis, the surgeon can recognize by palpation the thickened appendix and limit tenderness on pressure to the diseased organ, he will not be justified in operating. One broad rule governing the question of operative interference in appendicitis should be, not to operate in chronic cases unless you can feel the diseased appendix, nor in acute cases unless by palpation you can recognize either the diseased appendix or the presence of a tumor. Anæsthesia may be necessary, in exceptional instances, to decide the question.

The gravest complications following appendicitis are *septic peritonitis* and *septic thrombosis of the portal vein.* The latter is almost invariably fatal and may be recognized by fever, chills, sweating, rapid action of the heart, and local tenderness.

NON-OPERATIVE TREATMENT.—If in a given case of appendicitis an immediate operation is not decided upon, the management is symptomatic, as follows: Rest in bed, an ice bag or hot water bag to the abdomen, liquid diet, a small enema of warm soap water or oil each day or castor oil internally, and, to aid digestion, 5 to 10 drops of dilute hydrochloric acid, to be given in water after each feeding. It is not wise to mask the clinical picture by giving morphine or opium. When pus formation is evident, and an operation has been decided upon, the patient can be made comfortable by morphine subcutaneously. When the pain is quite severe and the pulse and temperature are not high, and it has been decided not to operate during the first attack, an injection of morphine may also be indicated.

BENIGN AND MALIGNANT NEOPLASMS OF THE INTESTINE

Diagnosis.—The diagnosis of *carcinoma* rests on the following points: The age of the patient, usually over fifty years, a palpable tumor, progressive anæmia and cachexia, signs of obstruction or disturbed bowel action, colicky pain and vomiting, the presence of blood, pus, and shreds in the stools, secondary deposits in the liver, lungs, and mammæ, and such other symptoms as may be inferred when the kidney or ureters are involved or perforation, fistulæ, and general peritonitis are present.

DIFFERENTIAL POINTS.—*Carcinoma of the rectum* may be mistaken for chronic dysentery or non-malignant stricture, and vice versa. A tumor due to *fæcal impaction* can be indented. *Cysts and tuberculosis of the peritonæum* or mesentery may simulate a cancerous tumor. *Movable kidney* and chronic appendicitis have been taken for cancer of the intestine. *Cancer of the pancreas*, of the *pylorus*, and of the *gall bladder* may simulate cancer of the intestine. *Benign tumors* have been observed and mistaken for cancer of the intestine. In all such obscure conditions the proper procedure is exploratory laparotomy with immediate extirpation and intestinal anastomosis if feasible. If the case is found to be "inoperable" x ray treatment is indicated.

INTESTINAL OBSTRUCTION, ACUTE AND CHRONIC

Symptoms.—The cardinal symptoms of intestinal obstruction are acute and severe pain (sometimes absent), no movement or passage of flatus from the bowels, vomiting (gastric, bilious, or fæcal), tympanitic distention of the abdomen, usually no fever, prostration and collapse in the terminal stage.

The Site of the Obstruction.—If the obstruction is high up, there is less abdominal distention than in obstruction of the colon; if in the lower bowel, there may be tenesmus and the passage of bloody mucus. Abdominal palpation and bimanual palpation externally and through rectum or vagina may reveal a tumor or swelling. On various occasions the writer has been able to detect the site of the obstruction by *noting where the tympanitic percussion sound of distended intestine merged into dulness over a collapsed area of intestine.*

Invagination, or *intussusception,* of the intestine may be ileocæcal, ileocolic, or colicorectal. In infants and young adults the onset is more or less acute, with tenesmus, mucus, and blood. Occasionally a sausage-shaped tumor can be felt.

Differential Points.—*Volvulus,* or twist of an intestine, is usually located in the large intestine or the sigmoid flexure, and gives no distinctive symptoms apart from those already enumerated.

Fæcal obstruction is usually chronic, with a history of constipation. Indentible fæcal masses can sometimes be felt.

Strangulation is usually through adhesions and narrow natural slits (foramen of Winslow, diaphragmatic hernia, and incarcerated hernia). A palpable tumor is rare in cases of strangulation.

Gallstone obstruction of the intestine is usually intermittent.

Stricture of the intestine from ulceration is seldom recognized before opening the abdomen, unless it is situated in the anal region.

Stricture of the intestine from a malignant or benign tumor cannot be recognized in a tympanitic abdomen.

Paresis of the intestine and obstruction sometimes follow abdominal section or peritonitis, and has been observed in neurotic constipated children. On *auscultation* the intestinal sounds are absent. Other rare causes of obstruction can only be conjectured.

In *enteritis* and diffuse peritonitis with obstruction there is generally a rise of temperature.

In *hepatic colic* and obstruction the pain is localized and characteristic, and jaundice is often present.

In *renal colic* and obstruction the urine shows hæmaturia or hæmoglobinuria.

Treatment.—The treatment of bowel obstruction is by high enemata and inflation, in the dorsal or knee-elbow or inverted position, by means of soap water (soft rectal tube); oil with the soft rectal tube; air with the soft catheter, bicycle pump, or hand bellows, or carbonic acid gas (inverted siphon).

The best guide to the amount which has been introduced is tension of the abdominal walls. A thorough trial should occupy fifteen to thirty minutes, and it may be repeated in an hour. It may be done under narcosis. Gentle manipulation through the abdominal wall is permissible.

If after two or three trials there is no improvement, *an operation* should not be delayed for more than three or four hours. In cases not acute, where several days have passed without symptoms of strangulation, laparotomy may be delayed longer and further attempts at reduction are proper. The writer has observed paretic and pronounced obstipation in a girl of nine years, lasting eleven days, with complete recovery. In ileus injections of atropine sulphate may be tried.

Cathartics are contraindicated as soon as the diagnosis of complete obstruction is made. Opium or morphine may be administered, to quiet pain.

HÆMORRHAGE FROM THE INTESTINES

Causes.—Hæmorrhage from the intestines may result from a variety of causes, such as dysentery, typhoid ulcer, malignant disease, the hæmorrhagic diathesis, acute and chronic, congestion in the portal circulation, a foreign body, simple ulcer, tuberculous or syphilitic ulcer, aneurysm, hæmorrhoids, vicarious menstruation, hæmorrhage from above the intestine, and swallowed blood. In bleeding from the intestines all these possibilities must be borne in mind, an exact diagnosis being arrived at by exclusion.

Treatment.—Rest, fluid diet, opium and acetate of lead internally, an ice bag to the abdomen, strychnine, and suprarenal extract. Hæmorrhage of the lower intestine may be controlled to a certain extent by means of clysmata of cold water, 1 quart; or alum water, ʒij ad Oij; or tannin in water, ʒj ad Oij; or by means of a tampon or the actual cautery.

REMARKS ON STRANGULATED HERNIA AND TAXIS

Definition.—An incarcerated hernia is one in which the bowel contents cannot escape, but in which the blood circulation is not cut off. A strangulated hernia is one in which the constriction is sufficient to shut off the circulation of the blood.

Symptoms.—The symptoms are the logical result of the conditions producing them and are sufficiently characteristic to allow us to form a diagnosis by a discrimination between functional constipation and abdominal shock with obstruction.

Pain. This comes suddenly, is severe, is at first localized, and becomes general over the abdomen. Sudden cessation of local pain without reduction of the hernia is a grave indication of gangrene.

Obstipation is pronounced throughout, but the lower bowel may empty itself, after which there will be no passage of gas or fæces.

Tympanites will increase until relief is offered.

Vomiting is early and persistent and eventually becomes stercoraceous.

The *pulse* is accelerated and becomes irregular, small, and thready.

The *temperature* may be subnormal in shock and collapse, and may be elevated from systemic intoxication.

The *local symptoms* are those of inflammation—swelling, heat, redness, pain, and tenderness. The face is pinched, drawn, and anxious.

Treatment.—The treatment for strangulated hernia is by operation. Before we cut down upon the strangulating structures it may be justifiable to place the patient in a position which may favor spontaneous reduction and apply an ice poultice to the seat of the trouble, and to employ gentle taxis with or without anæsthesia, with the hope of reducing the hernia. Failing in this after one or two trials, the use of the knife is indicated. To wait for fæcal vomiting or until the patient is exhausted is inexcusable.

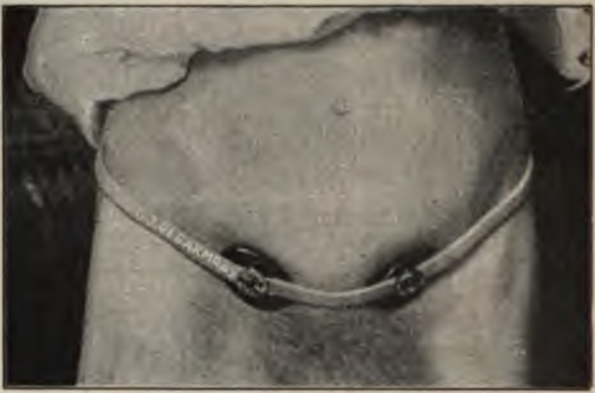

Fig. 111.—Represents a Properly Applied Truss for the Retension of Double Inguinal Hernia.

The frame is of German silver covered by hard rubber, with pads of the latter substance.

Clinical Varieties.—*Inguinal hernia* (complete or incomplete), *femoral hernia, umbilical hernia, ventral hernia, congenital hernia, diaphragmatic* and other internal hernias.

Regarding the question, "Does hernia exist?" it may be safely stated that reducible tumors in the region where hernias are found are generally hernia.

Dr. W. B. Degarmo's definition of a good truss: A well fitting truss is one which retains the protruding viscera within the abdomen and has its springs so shaped to the body that it will remain constantly in place no matter what position the body assumes.

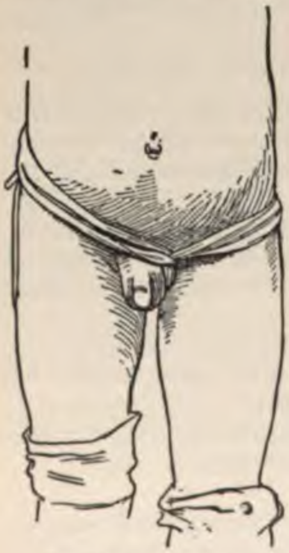

Fig. 112.—Skein of Worsted Truss.

INTESTINAL PARASITES

Common Forms.—The cylindrical worm (*Ascaris lumbricoides*), the thread worm (*Oxyuris vermicularis*), the tapeworm (*Tænia saginata* or *mediocanellata*, the beef tapeworm, sucking disks without hooklets; *Tænia solium*, pork tapeworm. The head has hooklets).

These species of worm are found in the adult as well as in the child. In America we generally see the beef tapeworm. The *Tænia solium* is the common tapeworm of Europe. When the mature proglottides are eaten by cattle, the ova wander into various tissues and become encysted as cysticerci.

TREATMENT.—The *cylindrical worm* is driven out by the administration of santonin, gr. j to ij, ter in die, and saline laxatives.

The *thread worm* is removed by enemata of garlic boiled in milk.

The *tapeworm* in man flourishes in the small intestine, and the only certain indication of its existence is the passage of links or sections with the stools. Give a saline laxative twenty-four hours before giving the following remedy:

No. 1.

℞ Oleoresin of male fern, ... ʒiij;
Ext. kamalæ fl., ... ʒij;
Chloroform, ... gtt. x;
Croton oil, ... gtt. ij;
Castor oil, ...qs. ad, ℥ij.

M. S.: Give in two doses, one half at 7, the remainder at 9 A. M.

The patient should eat little between the saline and the remedy.

Or give No. 2.

℞ Pelletierine tannate, ... gr. jv;
Oleoresin of male fern, ... ♏xxx;
Chloroform, ... ♏v;
Syrup, ... ℥j.

M. S.: Take in one dose after a saline laxative, fasting in the mean time.

Give a tablespoonful of castor oil two hours after the remedy has been taken.

Should the worm not be expelled, the remedy can be given a second trial after a week of preliminary medication, as follows:

℞ Spt. terebinth., }
Tinct. valerian æth., } āā, ... ʒij.

M. S.: Ten drops on sugar four times a day.

During this week the patient should frequently eat pumpkin seed and herring salad, also strawberries if they are in season.

A good tapeworm remedy in capsules is for sale in the shops under the name of Dietrich's tapeworm remedy.

Rare Forms: Ankylostomiasis Hook Worm Disease.—Dr. R. T. Hewlett, in the *Practitioner* for November, 1904, writes:

"Ankylostomiasis, the condition resulting from the presence of the intestinal worm, the *Ankylostomum*, or, as it is now termed, the *Uncinaria*, is a disease of very wide distribution, occurring over something like three fifths of the habitable globe. Attention has recently been specially directed to it from its occurrence in the Dalcoath Mine, Cornwall. In America it is widely spread, but the parasite here, the *Uncinaria americana* (Stiles), is a different species from that of the old world. The chief difference between the *U. duodenalis* and the *U. americana* are the replacement of two of the ventral recurved clawlike hooks of the buccal orifice of the former by a pair of semilunar plates, and by the egg of the latter being larger than that of the former. The larvæ, which develop in mud from the ova voided in the excreta, enter the body either by the mouth or through the skin without perceptible lesion. From the skin they pass into the lymph or blood vessels, are swept into the general circulation, and eventually reach the lungs, whence they pass from the blood vessels into the pulmonary alveoli. From the time the larvæ perforate the skin until they reach the lungs, they remain of the same size; but as soon as they reach the air vesicles they begin to grow rapidly. They pass into the bronchioles, up the bronchi and trachea, and, emerging through the glottis, pass down the œsophagus to the duodenum, where they become sexually mature. In order, therefore, to prevent infection, it is necessary, not only to safeguard the food, but also to protect the bare skin.

" The drugs of value in the treatment of ankylostomiasis are thymol and male fern. According to Lutz, 'after a light meal at 11 a.m., give calomel, 0.5 gramme, and powdered senna, 2 grammes, divided into four doses, one hour apart. The last dose may be omitted if sufficient action is secured by the three others, and if the full amount does not accomplish its end, more senna should be given; after this nutritious and easily digested liquid food is the proper diet. This insures liquid evacuations, after which thymol is given in 5 to 15 grain doses, in capsule, at intervals of four hours, until four capsules are taken, after which a dose of Epsom salts is given."

Anguillula intestinalis is the name of a parasite found in the stools in cases of colicky diarrhœa of the Asiatic zone. In the *treatment*, thymol and male fern are advised to be given internally.

Amœba Intestinalis.—(See also Amœbic Diarrhœa.)

1. The intestine of man may be infected with two varieties of amœbas, one pathogenic (*Entamœba dysenteriæ*), and the other non-pathogenic (*Entamœba coli*).
2. *Entamœba coli*, the non-pathogenic variety, is found in 65 per cent of the healthy individuals studied, and in 50 per cent of individuals suffering from diseases other than dysentery, if a saline cathartic has been administered.
3. These organisms can be easily distinguished in both fresh and stained specimens.
4. They differ widely in their method of reproduction, and this is the most important method of distinguishing them.—C. F. Craig, M.D.

ENTEROPTOSIS; SPLANCHNOPTOSIS; GLÉNARD'S DISEASE

Definition.—A general term applied to a falling or dropping of the abdominal viscera due to inherent or acquired weakness of the tissues.

C. Schwerdt, of Gotha, Germany, has reported ninety-five cases (eighty-nine in women, six in men). In sixty-nine cases the stomach was displaced (?) or atonic; in eighty-six cases the right kidney was movable. The liver and spleen play but a rare part in this condition.

Clinical Features.—The clinical features of enteroptosis are a sense of fulness in the epigastrium, nausea, eructations, vomiting, obstinate constipation, abdominal distention, and colic, and in more marked cases pain in the back and polyuria, and often in cases yet further advanced pain in the diaphragm, palpitation, dyspnœa, sleeplessness, mental depression, and melancholia—a clinical picture so often spoken of as "purely functional" or "neurasthenic," but which may be referred, with some show of reason, to a condition of "anatomical changes" *existing* and *demonstrable*.

The essential element productive of this dislocation is possibly a lessened *intraabdominal pressure* which has its origin in a lax, atonic anterior abdominal wall. Such a condition exposes the hollow organs, otherwise supported, to the influence of gravity when filled with their normal contents, and one part after the other tends to fall, pulling other parts with it.

The essence of the disease is to be sought for in the atonic and enervated condition of the nervous system. Predisposing factors are heredity, methods of living, all chronic diseases, the corset, and insufficient care during pregnancy and after. From this the conclusion is drawn that it is purely a constitutional disease. The anatomist, the pathological anatomist, and the clinician are, unfortunately, not in accord in determining what is normal and what is pathological in the position of various abdominal organs, and particularly the stomach.

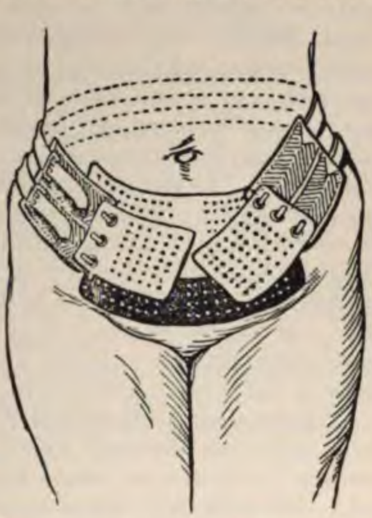

FIG. 113.—ABDOMINAL SUPPORT, PLASTER AND WEBBING (Dr. B. Schmitz).

Treatment.—The wearing of a well fitting plain abdominal support (without special pads for the support of special organs) is the proper treatment for enteroptosis. Regulation of the bowels and the cool douche to overcome "nervousness" give satisfactory results. In some instances it will be necessary to fasten a wandering kidney, which may be the source of annoying reflex symptoms. Dr. A. Rose improvises an adhesive plaster support for enteroptosis.

INTESTINAL PUTREFACTION AND TOXÆMIA; AUTOINFECTION FROM THE INTESTINES; INTESTINAL ANTISEPSIS

When fermentative changes in the gastrointestinal tract proceed beyond a certain point, they become a menace to comfort and health. Some persons experience little discomfort; others suffer severely.

Amylaceous Fermentative Dyspepsia produces acetic, lactic, butyric, and other acids and carbonic acid and other gases, giving rise to distention, pain, soreness of the abdomen, acid urine, divers neuralgias, hemicrania, and intercostal neuralgia, with and without constipation or diarrhœa, vertigo, etc.

Putrid Proteid Fermentation produces sulphuretted hydrogen, carbonic acid gas, and aromatic bodies, such as *indol*, *skatol*, and ptomaines or toxines, giving rise to malaise, fever, nervous depression, sleeplessness, melancholia, headache, vertigo, hemicrania, anorexia, or urticaria.

The gases formed provoke pain by distention, and the organic acids interfere with normal digestion and irritate the mucosa of the intestine (catarrhal inflammation of the intestine in children who eat too much candy).

The gases in both varieties may cause dyspnœa and suggest heart lesions and asthma (asthma dyspepticum).

Intestinal putrefaction in infants may give rise to very high temperatures and convulsions, and an early recognition is of prime importance. In renal, hepatic, and cardiac disease intestinal fermentation is a serious complication, and the great value of laxatives is obvious. Undue intestinal fermentation is also seen in anæmia, chlorosis, and leucæmia—in fact, anæmia and hæmorrhagic phenomena may result from intestinal fermentation. Epileptoid seizures and possibly chorea are caused by intestinal indigestion. In the present state of our knowledge scurvy must be looked upon as a chronic ptomaine poisoning from prolonged intestinal putrefaction. In all such cases the ethereal sulphates are found in the urine. As a practical test, the test for indoxyl in the urine is here given: Mix equal quantities of urine and strong HCl. Add a drop or two of freshly prepared chlorinated lime and a small quantity of chloroform, and shake. The indoxyl present will be converted into indigo blue by the chlorinated lime and show a blue color in the layer of chloroform. This is of value as a chemical test.

Management of Intestinal Fermentation.—Sufferers from autoinfection must take only perfectly sound food and such articles as are least apt to become the source of putrid fermentation within the intestines. Persons who are liable to "bilious attacks" and attacks of "sick headache" or dyspeptic vertigo must be careful in indulging in the pleasures of the table, and avoid late dinners with wine and rich food. Children should not be allowed to have much cake or candy, and must avoid unripe or overripe and spoilt fruit. The management of indigestion in infants is discussed in the pædiatric section of this book.

Diet in Intestinal Indigestion.—No inflexible rule of diet can be given. Fresh bread, sweets, rich pastry, leguminous foods, cabbage, dense cheese, mayonnaise, beer, and sweet drinks increase flatulence and must be avoided. Milk is well borne by some and not by others. Stewed fruit is usually well tolerated. Smoking may have to be stopped for a time. In some instances a change to a vegetarian diet is followed by marked improvement.

Exercise is a desideratum, such as walking, bicycling, rowing, riding, exercise with the punching bag, and gymnastics.

Baths.—A cool sponge bath is always beneficial.

Medication.—There is always marked improvement following free catharsis. Adults may take:

℞ Podophyllin.,	gr. ⅙ to ½;
Calomel.,	gr. x;
Pulv. aromat.,	gr. ij;
Sacchar.,	gr. x.

M. S.: For one dose.

On the following day five drops of dilute HCl in water may be given after each meal. When there is a tendency to constipation, a "lapactic" pill at night, or a teaspoonful of Carlsbad salt each morning in a cup of hot water will help.

Abdominal massage is beneficial. Hot water or hot peppermint tea once a day is also helpful.

Children may take:

℞ Calomel.,.................................. gr. j;
Sacchar.,.................................. gr. x.
M. S.: One such powder every hour until six are taken.

Or we may order castor oil or citrate of magnesia or rhubarb and magnesia, followed by two drops of dilute HCl in a teaspoonful of essence of pepsine after eating. Infants should receive no breast or bottle milk for six to eight hours, and should have farinaceous water instead of sterilized milk in hot weather.

Enteroclysis is helpful in intestinal indigestion in adults and children. Irrigation of the colon is a simple and valuable procedure.

Intestinal antiseptics of the salol and naphthol group are in the market by the score. *The best antiseptic for the bowel is its own action*, and the writer has been more successful in the management of indigestion on the lines laid down than by the administration of the modern coal tar derivatives. In gastrointestinal fermentation, and in indigestion secondary to cardiac, renal, and hepatic disease or acute infectious disease, we administer peppermint tea or dilute HCl after each meal, or

℞ Tinct. iodini,.......................... gtt. x to xx;
Syr. simplicis,.......................... ʒjv;
Aq. menthæ,.......................... ℥jss.
M. S.: A teaspoonful every hour or two, or several times a day.

This is to be used in connection with saline irrigations of the colon.

CHAPTER IX

THE DIGESTIVE SYSTEM—*Continued*

PROCTOLOGICAL MEMORANDA (RECTAL AILMENTS)

Synopsis: Preliminary Remarks.—Catarrh of the Rectum (Simple, Syphilitic, Atrophic Follicular).—Periproctitis and Abscess.—Impacted Fæces.—Foreign Bodies.—Condylomata (Syphilitic; non-Syphilitic).—Hæmorrhoids (Internal, External). —Rectal Polyps.—Rigid Sphincter.—Pruritus Ani.—Prolapse of the Rectum.—Simple Fissure and Painful Ulcer.—Ulceration and Stricture of the Rectum.—Neuralgia of the Rectum.—Coccygodynia.—Remarks on the Upper Rectum and Sigmoid Flexure.

PRELIMINARY REMARKS

Examination.—An examination of the rectum is made by the *finger* and by means of a *speculum* in direct or reflected light. The upper rectum and sigmoid flexure may be inspected with the "Kelly tube." Constriction of the calibre of the intestine from organic disease or by pressure from without, and extreme tortuosity of the sigmoid flexure with adhesions, may prevent the use of instruments. A long flexible silver probe is useful for exploring fistulous tracts. The most comfortable and delicate position in which the patient may be examined is on the left side; the left arm brought behind the body, the right shoulder turned away from the examiner, the right thigh well flexed upon the abdomen.

In interrogating the patient we inquire as to pain, protrusion of parts, discharge, gonorrhœa, bowel action, hæmorrhage, syphilis, menstruation, and pregnancy.

Before examining the patient the bowels must be moved, and in some instances local or general anæsthesia is necessary to a thorough examination. A knowledge of the state of the heart, kidneys, lungs, liver, central nervous system, and genital organs is essential to correctly interpret some of the conditions found in the rectum.

In the management of rectal disease, as in the treatment of nasal disease, local treatment is of prime importance in conditions requiring operative interference, but in the various catarrhal conditions too much local treatment often prolongs the trouble, and therefore general hygienic management steps to the foreground. The interdependence of rectal and genito-urinary disturbances must not be overlooked.

CATARRH OF THE RECTUM; PROCTITIS

On careful local examination we can distinguish four forms:

Simple acute catarrh, hypertrophic catarrh, atrophic catarrh, and *follicular inflammation.*

Proctitis is a catarrhal inflammation of the mucosa from many causes. There is a sense of heat and weight in the perinæum, with a constant desire to defæcate. The anus is hot and tender, and there is a mucous discharge. This form of inflammation may terminate in speedy resolution or develop into periproctitis, abscess, fistula, or ulcer.

General Treatment.—Remove the cause if possible. Order a dose of castor oil or a saline cathartic, a cold compress to the parts, or a suppository of opium and belladonna, āā, gr. ½.

In *periproctitis* with ischiorectal abscess the treatment is the same as in proctitis, and as soon as an abscess is evident, open it freely and pack the wound to allow it to heal from the bottom. A dressing of balsam of Peru or ichthyol ointment, 10 per cent, is advisable.

Chronic atrophic catarrh is a common ailment. A dry, brittle condition at the margin of the anus is characteristic of this affection and gives rise to intractable pruritus. In addition, there is constipation with dry stools and some mucous discharge.

TREATMENT.—Cleansing the intestinal tract with salt solution and injecting half an ounce of a 5 or 10 per cent solution of argonin is appropriate treatment. Where there is distinct ulceration the insufflation of aristol or iodoform is excellent. Hydrochloric acid may be required to aid digestion.

Hypertrophic catarrh is found in plethoric individuals. There is a persistent moisture at the anus, the stools are soft, liquid, or mucous, and there is marked flatulence with poor digestion.

TREATMENT.—Phosphate of sodium before breakfast, a general tonic, hygienic measures, and hydrochloric acid to aid digestion. Locally, we inject into the rectum from one to six ounces of a 25 per cent solution of aqueous extract of krameria.

Follicular inflammation, or catarrh, of the rectum shows a hyperæmic mucous membrane with small nodular, elevated swellings. Patients afflicted with this form of catarrh do not have a satisfactory stool, but go to the closet several times a day and pass small round masses coated with this mucus, and complain of flatulence.

TREATMENT.—The treatment is local and constitutional, as in the other forms.

IMPACTION OF FÆCES

The term impaction is used when the accumulation of fæces takes place in the pouch of the rectum. It may occur at any age and is due to inertia of the intestine or spasm of the sphincter, and it should be noted that a *fluid discharge from the bowels* (diarrhœa) is not incompatible with great retention of solid fæces.

Diagnosis and Treatment.—The *diagnosis* is made by digital examination, and the impacted mass is removed by breaking it up with the fingers or by means of a spoon handle. After the patient is relieved, general hygienic and tonic management, including massage, are indicated.

A rigid sphincter is often associated with fissure and is the cause of many cases of constipation in children and adults. It requires digital divulsion under narcosis by means of the thumb and index finger. This effort must be continued until the muscle has lost its power.

Foreign bodies in the rectum are detected by digital examination and are removed under narcosis if necessary.

Condylomata, warts, excrescences, vegetations, and **mucous tubercles** occur at the anus and vulva. There are two varieties: Condylomata lata and condylomata acuminata. Condylomata may be of syphilitic origin or may be due to irritation and filth. Those of syphilitic origin disappear after specific treatment and cauterization with nitrate of silver or chromic acid. The others may be snipped off with sharp scissors, and the bleeding spots should be cauterized.

FISTULA IN ANO

Definition.—A sinus left by an abscess in the neighborhood of the anus. A blind fistula has no communication with the intestine. A complete fistula communicates with the lumen of the intestine. The external orifice may be of the size of a pin or lie in the centre of a mass of granulations. The fistula secretes a thin purulent fluid. Now and then the orifice becomes obstructed, the discharge collects, a small abscess forms, and the skin becomes hot and tender. When this breaks, the symptoms subside. A certain proportion of anal fistulas are of tuberculous origin. In making a bacteriological diagnosis the Smegma bacillus should not be mistaken for the tubercle bacillus.

Treatment.—The parts are made anæsthetic by means of cocaine or, according to Gant, by injections of sterile water under the skin. A grooved director is passed into the fistula and out through the anus and the tissues are divided until the director is free. Peroxide of hydrogen is now sprayed on the wound and the latter packed with iodoform gauze. The patient can go about on the following day, wearing a diaper or bandage. An incomplete fistula is made complete by forcing the grooved director through into the gut.

HÆMORRHOIDS (PILES)

Definition.—A varicose condition of the vessels around the anus, frequently associated with eversion of the rectal mucous membrane.

External hæmorrhoids are of two kinds:

a. A tag of skin somewhat inflamed.
b. A thrombotic or blood clot hæmorrhoid.

The symptoms of both varieties are very much the same, heavy, weighty feeling and an aching pain. Some piles have an ulcerated surface.

Treatment.—*a.* PALLIATIVE. A laxative medicine, heat or cold to the part, and subsequently the following ointment:

℞ Calomel.,	ʒss.;
Ext. opii, Ext. belladonnæ, } āā,	gr. x;
Vaselini albi,	℥j.

M. S.: Apply frequently.

An ointment of tannin, opium, and belladonna, or of cocaine, gr. x, carbolic acid, gr. xx, and vaseline, ℥j, is also effective.

b. Operative. The skin hæmorrhoid may be cut off at its base with a pair of scissors. The thrombotic pile should be slit open with a sharp knife and the blood clot released. The wound may be dressed with carbolated vaseline.

Internal Hæmorrhoids

These are troublesome on account of hæmorrhage, protrusion, and pain. They can readily be distinguished from a polypus, which has a pedicle, and from prolapse of the rectum by its velvety appearance and uniformity of circumference. Cancer and ulceration of the rectum cannot be mistaken for hæmorrhoids by a careful examiner. Among the local causes of hæmorrhoids may be mentioned as of importance any condition which interferes with the return flow of blood from the rectum, tumors, the gravid uterus, constipation, and circulatory obstruction of hepatic, renal or cardiac origin.

Treatment.—*a.* Palliative. The first indication is to prevent fæcal accumulation and establish soft stools. With that object in view, we not only resort to certain medicines, but we must put the patient on appropriate diet and under good hygienic surroundings. Absolute cleanliness of the anus and irrigation with tannic acid and alum are among the latter. Of medicines, rhubarb and its preparations, and pulv. liquirit. comp., are useful, but all drastic purgatives are to be avoided. When bleeding is copious, injections of fl. ext. of hamamel. virg., a teaspoonful to a wineglassful of water, used once daily, are sufficient. In the event of an "attack" of inflammation the patient is put to bed, the bowels are kept open, and heat or cold is applied. An ointment of opium and belladonna or cocaine is serviceable. After the "attack," daily cold water enemata may be continued for a long time.

b. By Injection. A solution of carbolic acid may be injected into the *protruding* hæmorrhoidal tissue once a week:

℞ Acid. carbolic, pur., ... }
Glycerini, ... } equal parts.
Aquæ, ... }

M. S.: Inject five drops into the centre of the pile.

This process takes several weeks to effect a cure. The instruments required to give the injections are:

1. A *hypodermic syringe* of glass and a platinum needle two inches long. The needle can be readily sterilized by making it red hot in the flame of an alcohol lamp. 2. A *rectal speculum* with a section of its wall cut out and replaced by a sliding piece. This permits of the inspection and treatment of isolated portions of the bowel. 3. *Aluminum* or *silver cotton carriers* with cotton for mopping and cleansing the parts.

The patient is to have an enema a few hours before treatment. The small tumors are injected first, and the trifling pain from the needle can be overcome by applying a 5 per cent cocaine solution to the parts on a cotton swab. Two or three piles are injected at each sitting. Piles that do not protrude can be reached by means of the speculum. Two sittings a week can be safely carried out.

c. Operative Treatment. *Whitehead's Method.*—Resection of the entire hæmorrhoidal area is an operation of some magnitude, and its success depends upon aseptic and primary healing in a region where asepsis is difficult to obtain.

Allingham's operation.—Excision of each hæmorrhoidal tumor, with ligation of the vessel at its base, is free from risks and an excellent operation.

The *clamp and cautery operation* can be rapidly performed and gives very satisfactory results.

RECTAL POLYPI

They are found in children and adults. They are pedunculated growths attached to the mucous membrane, and may be soft or fibrous, and are sometimes multiple. By thoroughly searching the bowel they can be felt and seen. They give rise to the following symptoms: Tenesmus, desire to go to stool, bleeding, and the passage of mucus. They may protrude from the anus on straining.

Treatment.—They should be removed by means of a torsion forceps or by ligature.

PRURITUS ANI

Painful itching of the anus is a very distressing minor ailment, often very intractable, but eventually curable if the patient will persist in carrying out well directed treatment. The itching and irritation are worse at night, when the patient is in bed, and they interfere with sleep. Pruritus is possibly a pure neurosis, but usually there is some underlying local or constitutional cause, such as gout, diabetes, or hepatic disease, hæmorrhoids, uterine disease, vaginal discharges, constipation, ascarides, or pediculi.

The **treatment** must be directed to any underlying constitutional dyscrasia and the removal of local irritation. The parts should be thoroughly washed several times a day with soda water followed by a 2 per cent carbolic acid solution. If an examination with a magnifying glass reveals fissures or breaks in the mucous membrane of the parts, cauterization with a 5 per cent nitrate of silver solution is indicated, three times a week.

The following dusting powders and protecting ointments are useful:

Stearate of zinc with acetanilide.
Powdered starch.
Powdered talcum.

℞	Camphor ice,	℥j;
	Acid. carbolic.,	ʒss.;
	Cocain.,	gr. x.
℞	Vaselini,	℥j;
	Ichthyol.,	ʒj;
	Cocain.,	gr. x.
℞	Vaselini,	℥j;
	Menthol.,	ʒss.;
	Bismuth subcarb.,	ʒj.

In intractable cases of pruritus a division of the nerves leading to the parts has been practised with apparent success.

PROLAPSE OF THE RECTUM

Prolapse or protrusion of the rectum is common in flabby, anæmic, and rhachitic children, but may occur at any age.

Causes.—The causes are a relaxed state of the sphincter muscle, straining due to any local cause in the genitourinary and rectal regions, such as stricture, stone, a foreign body, a polypus, phimosis, worms, constipation, and piles.

The protruding bowel may be recognized as such by its central aperture. In protruding intussusception a sulcus can be made out between the protruding bowel and the sphincter. In rare instances the protruding bowel may become strangulated and slough away.

Treatment.—Reduction of the protrusion, strapping of the nates, regulation of the bowels, and rectal injections of cold alum water, ʒij to 1 qt., twice a day. General tonic and hygienic management will suffice for the majority of cases in flabby, anæmic children.

Should such simple methods fail to cure, linear cauterizations with the galvanocautery or actual cautery in the long axis of the bowel are necessary and will cause the mucous membrane to adhere to the muscular coat by inflammation. In every case a careful examination will be necessary in order to exclude or detect and remove any source of local irritation.

Prolapsus Ani in Children—Paraffin Injections.—For the relief of rectal prolapse in children Karewski (*Centralblatt für Chirurgie,* July 12, 1902) has employed subcutaneous injections of paraffin having a melting point of 56° to 58° C. The patients, purged for two days, on the day previous to operation received large doses of bismuth to lock up the bowels. The field of operation was disinfected and the prolapse was reduced. A finger was then introduced into the rectum to act as a guide. Through one needle puncture the paraffin was injected in the form of a ring above the anus between the skin and mucous membrane. By suitable diet and the administration of bismuth an evacuation of the bowels was prevented for the following twenty-four hours. Eight children between two and eight years of age were treated by this method. One case was unsuccessful because of a faulty technique, but all the remainder were cured so far as could be judged from examinations made in from two to six months after the operation. In two cases the paraffin had to be injected a second time, and in a case of an idiotic, feeble child a third injection was made. In the remaining cases a single introduction of paraffin sufficed. Although in some of the cases the bowels moved during or shortly after the operation, an infection never occurred, because the injection wound was kept protected.

SIMPLE FISSURE AND ULCER OF THE RECTUM

These very painful affections are found oftener in women than in men. Their location may be anterior or lateral, but it is usually dorsal, near the anus or high up in the rectum. They may be single or multiple. They are caused by straining and the passage of very hard, dry stools, and other causes. The patient complains of great pain on defæcation, and occasionally blood and matter are found in the stool. The agonizing pain induces the sufferer to postpone relieving the bowels as long as possible, and generally produces a high degree of nervous irritability. The site of the fissure or ulcer is often marked by a club-shaped papilla, more or less inflamed, protruding from the anus. On introducing the finger the ulcer is readily detected and is quite painful to the touch.

Treatment.—A laxative should be taken at night, and the following ointment should be frequently applied:

℞ Calomel, ... gr. xxx;
Extr. opii, } āā, ... gr. x;
Extr. belladonnæ, }
Vaselini alb., ... ℥j.

An occasional light touch with nitrate of silver is useful.

Should the ulcer or fissure fail to heal by such management, the patient must be anæsthetized and the sphincter should be stretched thoroughly. A speculum is now introduced and the edges of the ulcer are cut away with a pair of sharp scissors and a knife is drawn over the ulcer, cutting through its base and if necessary into and through the external sphincter at right angles to its circular fibres. At the same time the aforementioned protruding club-shaped skin flap is also cut away. As a dressing, the above ointment will answer. This procedure will effect a cure. *A fissure* will heal after a thorough stretching of the sphincter.

Ulceration located high up in the intestine requires irrigation through the colon tube every other day with ½ per cent nitrate of silver solution followed by normal saline solution. On alternate days an emulsion of bismuth, ʒj, iodoform, gr. x, olive oil, ℥iv, should be injected and retained. As a final resort, an artificial anus should be established and irrigation practised from above.

ULCERATION AND STRICTURE OF THE RECTUM

Congenital strictures have been mentioned in the chapter on Diseases of the New-Born.

Acquired strictures may be due to pressure and constriction from without (pelvic inflammation), cancer, cicatrices from simple or dysenteric ulceration or from injury, cicatrices from tuberculous ulcers, cicatrices from syphilitic ulceration, cicatrices from soft chancre and gonorrhœa and unnatural practices. The syphilitic variety is often combined with condylomata. Fissures may form below the stricture, and hæmorrhoids are a frequent concomitant.

Symptoms, Diagnosis, and Prognosis.—Local pain, radiating pain, difficulty in having a motion, constipation alternating with diarrhœa, with the motions small and streaked with mucous discharge. In addition, there are general dyspeptic symptoms and belching of wind, and the patient becomes anæmic and worn out by constant suffering or from profuse hæmorrhage, and unless relieved dies of exhaustion or obstruction and peritonitis. There are often sympathetic vesical disturbance and loss of sexual power.

The DIAGNOSIS is made by local examination with the finger and speculum, and when the trouble is high up, by means of Kelly tubes or an exploratory laparotomy. The great point to be decided is the distinction between cancer and non-malignant disease. Cancer of the rectum generally runs its course in two or three years. A cancerous mass is hard to the touch, nodular, irregular, and without a pedicle, and involves adjacent parts. It may also present as a deep ulceration or a bleeding fungous mass, and frequently we find enlarged glands in the groin or in the hollow of the sacrum. In doubtful cases the microscope will aid in diagnosis.

Even greater difficulties confront us when attempting to distinguish between the various forms of non-malignant strictures. Dysenteric ulceration and contraction is known by its history. Tuberculous disease may be suspected from a coexisting lung trouble or from the patient's general condition. A reliable history of syphilis may justify the diagnosis of syphilitic stricture, and finally we must not forget that unnatural sexual intercourse, resulting in injury or infection, may be the cause of ulceration and contraction.

Treatment.—Fibrous strictures can be overcome by dilatation, with and without linear incision (proctotomy). If syphilis or tuberculosis is the underlying cause, hygienic treatment and specific medication (with mercury, potassium iodide, etc.) must be employed at the same time. Electrolysis accomplishes little or nothing. Colotomy and extirpation of the rectum must be employed in otherwise intractable cases. Colotomy is indicated in old and incurable cases of non-malignant ulceration, stricture, and fistulæ which are threatening life by exhaustion or obstruction. It may be indicated in obstruction exterior to the bowel, in cases of intestino-vesical fistula, and in "inoperable" cancer of the rectum, or when excision is for any reason contraindicated. The benefits of colotomy are manifest. The choice lies between the inguinal and the lumbar operation. Ability of the patient to care for the opening and secure cleanliness is in favor of the inguinal site. Opium or morphine must not be denied the sufferer from malignant strictures.

NEURALGIA OF THE RECTUM

A severe and sickening pain in the rectum, *not* aggravated by the action of the bowels, and for which there is no apparent local cause. It is not infrequent in older children and adults of a neurotic type, is more apt to come on in times of worry and excitement, and may come on during sleep and keep the sufferer awake for hours.

Treatment.—Hygienic management, cold sponge baths, avoidance of constipation, and in severe cases a stretching of the sphincter muscle are indicated. If the patient is anæmic, iron or arsenic is indicated. If he is very neurotic, the bromides are to be given for a short time. Vibratory massage gives prompt relief in many cases.

COCCYGODYNIA

Definition.—Neuralgic pain in the sacrococcygeal joint. Not infrequent in neurotic women.

Treatment.—The treatment is the same as for neuralgia in the rectum. A careful examination, to detect if possible a local source of irritation, should be made. In rare instances excision of the coccyx is necessary.

THE UPPER RECTUM AND SIGMOID FLEXURE

This region is accessible to some extent by means of the Kelly tubes. New growths, ulcers, and catarrhal conditions are found to exist here as in the lower rectum.

The non-operative treatment consists in flushing the parts with saline or boric acid solutions and the local application of astringents and healing remedies. Hygienic measures and open bowels are the foundation of all treatment. Too much local treatment, particularly in catarrhal conditions, is meddlesome and harmful.

The so called *morning diarrhœa* and *mucous diarrhœa* are generally due to some pathological condition of the rectum, sigmoid, or descending colon.

CHAPTER X

THE DIGESTIVE SYSTEM—*Continued*

DISEASES OF THE LIVER, GALL BLADDER, BILE DUCTS, PANCREAS, PERITONÆUM, OMENTUM, AND ABDOMINAL LYMPH NODES

SYNOPSIS: **Diseases of the Liver.**—Preliminary Remarks.—Corset Liver.—Floating Liver—Displaced Liver.—Jaundice.—Acute Congestion of the Liver, Active and Passive.—Acute Yellow Atrophy of the Liver.—Chronic Hepatitis (Cirrhosis), Atrophic and Hypertrophic Forms.—Abscess of the Liver and Pylephlebitis.—New Growths of the Liver.—Echinococcus of the Liver (Hydatid Cysts).—Chronic Degenerative Processes of the Liver.—Syphilis of the Liver.—Atrophy of the Liver.—Fatty Degeneration of the Liver.—Fatty Infiltration of the Liver.—Amyloid Liver.—Inflammation of the Serous Coat of the Liver.—Aneurysm of the Hepatic Artery.

The Gall Bladder and Bile Ducts.—Catarrh of the Bile Ducts.—Acute Inflammation of the Gall Bladder.—Gallstones.—Courvoisier's Law.—Dropsy and Empyema of the Gall Bladder.—Gallstones, Acute and Chronic Obstruction.—Indications for Operative Treatment.—Cancer of the Biliary Apparatus.

Diseases of the Pancreas.—General Remarks.—Acute Hæmorrhagic Pancreatitis.—Acute Suppurative Pancreatitis.—Tumors of the Pancreas.—Pancreatic Calculus.

Diseases of the Peritonæum, Omentum, and Mesenteric Glands.—Acute Peritonitis.—Subphrenic Abscess.—Chronic Peritonitis.—Cancer of Peritonæum and Omentum and Cysts.—Acute and Chronic Inflammation and Degeneration of Abdominal Lymph Nodes.

DISEASES OF THE LIVER

GENERAL REMARKS

IN order to fully understand the clinical pathology of the liver, the following points should be borne in mind. The blood pressure in the portal capillary system is extremely low. Therefore minute disturbances may impede the flow of blood and produce passive congestion in the liver, and chemical and bacterial poisons from the intestines and in the blood and metastases of malignant growths readily affect the liver. Under normal conditions the liver dulness in the mamillary line extends from the lower border of the sixth rib to, or slightly beyond, the sternal border.

Fluids in the right thorax, a massive indurated lung, exudates and tumors between the liver and diaphragm, and tumors of neighboring organs may simulate enlargement of the liver. Tympanites and ascites make the liver dulness appear small. Deductions based upon a small liver dulness should be carefully weighed. A large, tender, or very hard liver is not in a normal condition. A deformed (rhachitic) thorax may give to the liver an abnormal position.

Corset liver and *lobed liver* are sometimes caused by tight lacing and by wearing tight belts.

A *floating liver*, or dislocated liver, is a rare condition which when found is probably an associated feature of pendulous belly and may be due to a congenital defect in the suspensory ligaments of the organ. A floating liver may give rise to various reflex symptoms and attacks of colic, which may be overcome to a large extent by the wearing of an abdominal support, as discussed in the chapter on Enteroptosis.

JAUNDICE AS A SYMPTOM

Jaundice may manifest itself in disease of the liver and in various other conditions in which the free flow of bile into the small intestine is interfered with. When the flow of bile is obstructed, and its production by the liver parenchyma continues, we have an overfilling of the gall bladder and a resorption of bile by the lymphatics into the general circulation, as shown by the icteric pigmentation of the tissues from light yellow to brown or green. The urine, the sweat, and inflammatory exudates show this coloration. The tears, saliva, and gastric juice do not as a rule appear yellow. The cholates of the bile also get into the circulation and act as systemic poisons. Jaundice is not dependent upon complete obstruction of the large bile duct, and any localized obstruction in the liver may be associated with jaundice. In gallstone colic with incomplete obstruction jaundice is often absent.

The symptomatic jaundice in infectious septic conditions and in certain intoxications (phosphorus) is probably due to fatty degeneration of the liver cells, in which condition absorption may take place without obstruction. Although we know that bilirubin may form from hæmoglobin, owing to changes which take place in blood extravasation, it is pretty well established that a jaundice without the aid of the liver cells is not likely.

Whenever bile fails to get into the intestine, nutrition is markedly interfered with, and when bile enters the circulation the cholates act as nerve poisons, blood pressure is diminished, the heart becomes slow and irregular in action, and coma may set in (cholæmia). A thick, tenacious bile is more readily absorbed than a thin bile. Cholæmic symptoms depend upon the concentration of the poison in the blood, so that we may observe intense jaundice without much constitutional disturbance. On the other hand, coma, convulsions, delirium, fever, etc., are observed in icterus gravis as well as in hepatic disease with little or no jaundice.

Symptoms Associated with Jaundice.—In jaundice of long standing, we notice a tendency to hæmorrhage from the mucous membranes (acquired hæmorrhagic diathesis), and we find the urine to contain albumin and hyaline casts in addition to bile. The skin, mucosa, and conjunctiva turn yellow, brown, or green. The skin becomes blotchy and itches. The stools are clay colored, pasty, and fœtid. The heart's action is slow, notwithstanding a moderate rise of temperature, and the pulse may be intermittent. The patient is irritable, depressed, delirious, or comatose (typhoid state) and may have convulsive seizures.

Clinical Forms of Jaundice.—*Jaundice* of the *new-born*, mild and septic (see Pædiatrics), *mild catarrhal jaundice*, at all ages, *icterus gravis* of hepatic origin (acute, chronic, infectious, and obstructive), *infectious jaundice*, and *toxic jaundice*.

Jaundice with Reference to Its Origin:

OBSTRUCTIVE JAUNDICE.	Gastroduodenal catarrh, catarrh of the bile ducts, gallstones or worms in the bile duct, pressure on the duct by tumors of any neighboring organ or fæcal accumulation or aneurysm, cicatricial stenosis of the bile duct, pressure of the gravid uterus.
HEPATIC JAUNDICE.	Acute and chronic hepatitis, acute yellow atrophy of the liver.
TOXÆMIC JAUNDICE.	Microbial toxines (infectious disease), epidemic jaundice, jaundice following vaccination, influenza, typhoid fever, and other infections, also tonsillar infection, chemical poisons, snake venom.

Prognosis.—The prognosis of jaundice cases depends upon the underlying cause. The mild, catarrhal form in children and adults terminates favorably in from one to six weeks. In the new-born, the mild form lasts from a few days to three weeks. Severe infectious jaundice in the new-born is usually fatal.

The infectious, or toxic, jaundice in older children may last three to four months, particularly if occurring in subjects with *fatty liver*, and may end in recovery or death. In severe obstructive forms recovery depends upon our ability to remove the cause. In jaundice of long standing an exploratory laparotomy is indicated with the hope of finding and removing an obstruction (gallstones, stricture).

CATARRHAL JAUNDICE IN OLDER CHILDREN AND ADULTS

Treatment.—In mild, non-febrile cases the patients may be treated out of bed. Febrile and severe cases should rest in bed.

DIET.—Milk, meat, eggs, cereals and other soft diet, stewed fruit, pineapple or orange juice, beef jelly, wine, tea, tropon in peppermint tea, water, Vichy, or Carlsbad water. Fat is to be avoided. Usually there is a loathing of food and the appetite must be tempted by offering palatable articles.

MEDICATION.—Five to ten grains of calomel should be given at once, followed by a saline cathartic. Carlsbad salts or sodium phosphate may be given frequently to keep the bowels free. To aid digestion, five drops of dilute hydrochloric acid should be given in water, after eating. The so called cholagogues are probably useless. *Large quantities of water by the mouth and per rectum are imperatively demanded.* In protracted cases, in which syphilis or malaria is suspected as an underlying cause, quinine or Warburg's tincture may be given by the mouth or potassium iodide per rectum. In severe indigestion rectal alimentation may be employed, and the patient should remain in a covered hot bath, 105° F., for an hour daily, with the object of eliminating the systemic poison through the skin. Mild massage is beneficial.

Itching may be controlled by powdering with starch or sponging with a warm soda solution. Furuncles and cold abscesses should be opened as soon as fluctuation is evident.

HYPERÆMIA OR CONGESTION OF THE LIVER

The liver, like any other organ, is subject to active and passive congestion. An active physiological hyperæmia takes place during digestion. Thus, a heavy eater with little or no exercise may suffer from a liver which is actively or passively congested all the time. Active congestion is observed in malarial disease and dysentery and in diabetes. Passive congestion is the rule in pulmonary and cardiac disease and obstruction to the inferior cava. The nutmeg liver is often an evidence of such conditions at autopsies.

Symptoms.—Hepatic congestion reveals itself by a dull, heavy feeling in the region of the liver and by a painful stitch. The patient prefers to lie on the right side. Dyspeptic symptoms are marked and slight jaundice may be observed, and the liver is enlarged and tender to the touch. A diagnosis of congestion of the liver means nothing unless we elicit the underlying cause at the same time, for it may be due to overfeeding and laziness, or it may be the beginning of hepatic cirrhosis, or it may be secondary to cardiac or pulmonary disease.

Treatment.—The treatment will vary with the cause. The best way to influence a congested liver is by dieting (plain mixed diet, 2,000 calories), by exercising, and by purging with calomel, podophyllin, blue mass, or Carlsbad salts.

In passive congestion from cardiac and pulmonary disease, and particularly if dropsy is present, an infusion of digitalis should follow in the wake of a brisk purge, or venesection should be done. Carlsbad salts in hot water, in the morning, may be taken for a long time in hepatic congestive conditions.

ACUTE YELLOW ATROPHY OF THE LIVER; MALIGNANT JAUNDICE

This is a rare but fatal disease which may be defined as an acute infection of the liver in which there is a rapid disintegration of the liver cells accompanied by great reduction in the size of the organ, with deep jaundice and grave nervous symptoms. The condition is similar to that produced by phosphorus poisoning.

Symptoms.—The *principal symptoms*, extending over two to four weeks, are jaundice, vomiting, delirium, hæmorrhages, and rapid atrophy of the liver. Leucine, tyrosine, bile, and albumin are found in the urine.

In the way of **treatment** nothing can be done beyond cleansing the alimentary tract and stimulating the patient.

CIRRHOSIS OF THE LIVER

Definition.—A chronic hepatitis characterized by enlargement and subsequent atrophy, the liver being usually hard and small at the terminal stage of the disease. There is another class of cases called the hypertrophic, or biliary, form. Both are the result of an abnormal development of connective tissue, with contraction as a prominent feature in one, but not in the other. In the hypertrophic form the sufferer probably dies before the stage of contraction is reached.

Ætiology.—Chronic hepatitis is due to microbial infection of the liver through the circulation and from the intestinal tract. Alcoholism and gastrointestinal fermentation are predisposing factors, also syphilis and malaria. The disease is most frequent in middle aged men and is also found in children; in the latter malaria, congenital syphilis, scarlet fever, and gastrointestinal fermentation are the predisposing factors.

Symptoms and Diagnosis.—All forms of cirrhosis have practically the same symptoms, which are obstructive and toxic. The obstructive symptoms are chronic gastric catarrh, occasionally hæmorrhage from the alimentary canal, epigastric distention, enlargement of the spleen and of the epigastric veins, ascites and fluid in various cavities and œdema of the feet. Jaundice is often present. The spleen is generally enlarged, the urine is diminished and concentrated and may contain albumin, especially in the later stages, and the stools have a light color. The liver is large and tender in the hypertrophic stage and hæmorrhoids are present. There is nothing characteristic as to the range of temperature. Dyspnœa is often an early symptom. In biliary cirrhosis (hypertrophic form), jaundice is almost as intense as in biliary obstruction, but the stools remain colored. The toxic symptoms are delirium, stupor, coma, and convulsions, as in any other form of toxæmia, and they occur in the terminal stage.

The diagnosis of cirrhosis may be quite difficult to make, and only large clinical experience will enable us *in some cases* to distinguish between chronic passive congestion, cancer, amyloid liver, and tuberculous peritonitis with ascites. A condition of perihepatitis is sometimes observed at the autopsy in cases of hepatitis, the capsule of the liver being thickened. Pain is a prominent symptom in this class of cases.

Prognosis.—The prognosis of advanced cases is unfavorable.

Treatment.—As the disease in its early stages, when it might be influenced by treatment, is frequently not recognized, the treatment of its pronounced manifestations is naturally symptomatic. However, it is no more than right that a patient suffering from chronic hepatitis should receive the benefit of such specific treatment as we possess, and in each and every case a course of *antiluetic and antimalarial* treatment is to be tried. Failing in our efforts in this direction, our symptomatic treatment will be conducted on the following lines: Enemata or laxatives, to secure daily bowel movement; ten drops of hydrochloric acid and ten drops of tinct. gentian. com., in water, after each meal, to aid digestion; daily moderate exercise and mild general massage and massage of the abdomen; a liberal diet (2,000 calories), avoiding cabbage, beans, pork, pastry, and fried fish; alcohol in moderation not to be forbidden for those who are accustomed to it; carbonated alkaline waters (Vichy), ginger ale, and peppermint tea are drinks to be recommended.

OPERATIVE TREATMENT OF ASCITES AND CIRRHOSIS OF THE LIVER.—The writer was the first to employ *permanent drainage* for the relief and cure of ascites from cirrhosis and from other causes. The modus operandi of this procedure is described and illustrated in the article on Ascites.

Talma's operation (the suture of the omentum to the peritonæum) is not indicated in ascites due to causes other than cirrhosis of the liver. Permanent drainage and Talma's operation are indicated in cirrhosis of the liver in cases in which internal medication (particularly with iodide of potassium) and paracentesis fail to afford relief, and in those cases in which there is no reasonable contraindication.

ABSCESS OF THE LIVER AND SUPPURATIVE PYLEPHLEBITIS

Hepatic abscess is always due to infection, but traumatism may be a direct incitive factor. The various *pathological factors* which give rise to abscess formation in the liver may be grouped as follows. Infection by means of foreign bodies (needle, fishbone, gallstones). Infection by means of parasites (echinococcus, round worms, amœba, actinomycosis, etc.). Infection by means of pyæmic embolism, from suppurative pylephlebitis, typhoid ulcer, ulcer in dysentery, tropical abscess, appendicular ulcer, pelvic suppuration, gangrene of the intestine, puerperal sepsis, gall bladder suppuration, etc.

The infecting agent may reach the liver by way of the portal vein or hepatic artery. The abscess may be solitary or multiple. The so called "tropical liver abscess" occurs most frequently in the hot countries. Sporadic cases of tropical liver abscess are encountered as exotic manifestations in the temperate zones. Hepatic abscess is at times the result of trauma; usually, however, it is the result of invasion of the hepatic tissue by various forms of parasites, protozoa, and pyogenic organisms.

Symptoms.—The cardinal symptoms are irregular fever, chills, and septic phenomena, sweats, enlargement of the liver, hepatic and right shoulder pain, moderate jaundice, a sallow complexion, and gallstone disturbances. *In doubtful cases aspiration of the liver is indicated.*

DIFFERENTIAL POINTS.—In *malarial fever* the plasmodium is found in the blood, and the administration of quinine brings improvement and cure. In *typhoid fever* we observe roseola and frequently a positive Widal reaction. Hepatic abscess may complicate typhoid fever.

A *right sided pyothorax* may result from hepatic abscess breaking through the diaphragm into the pleural cavity. The aspirated pus in such cases is brownish in color and liver cells may be found with the aid of the microscope. *Rapid cardiac failure* with congestion of the liver and excruciating pain has been mistaken for hepatic abscess.

The **prognosis** is grave.

Treatment.—SURGICAL: When adhesions have formed between the liver and the abdominal wall and the abscess points, simple incision and drainage are indicated. When this is not the case, operative interference involves the opening of the abdominal cavity in order to have access to the liver. The single large abscesses offer the best chance for an operation. Pyæmic abscesses and suppurative pylephlebitis are generally fatal.

The NON-SURGICAL management is that of septicæmia.

NEW GROWTHS OF THE LIVER

The *malignant* new growths are *primary* and *secondary cancer*, including cancer of the bile passages; *primary* and *secondary sarcoma*. Clinically, carcinoma and sarcoma of the liver cannot be distinguished one from another. They are classified under one heading and will be spoken of as "cancer." Cancer of the liver is usually secondary. It is a disease of late adult life and rarely occurs in children. It is less common in the tropics and in malarial districts than elsewhere.

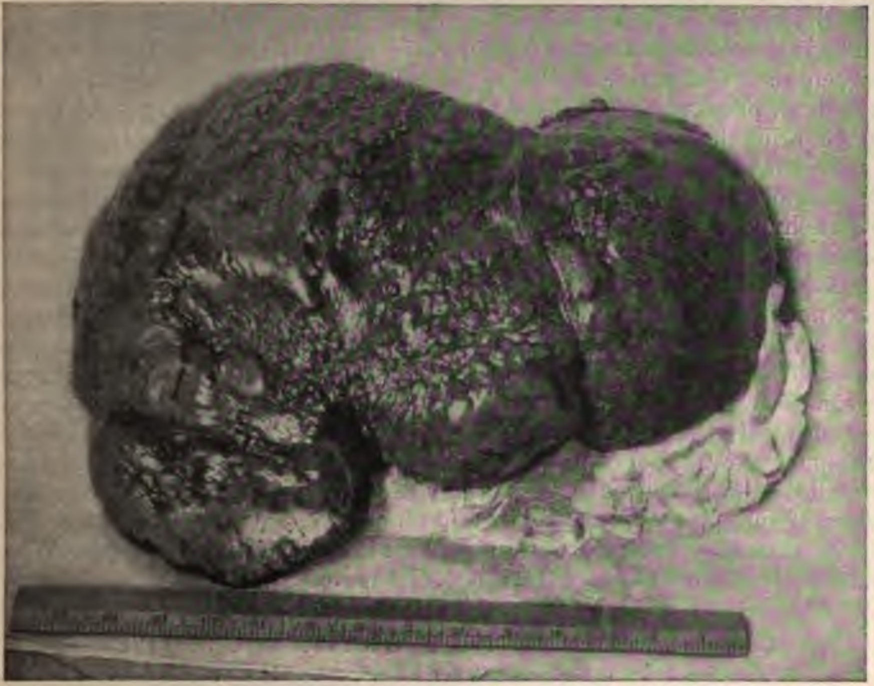

FIG. 114.—CANCER OF THE LIVER (Dr. Halsey's case).

Symptoms.—Progressive enlargement of the liver, gastric disturbances, progressive loss of flesh and strength, pain or discomfort in the right hypochondrium, moderate jaundice in half the cases, ascites occasionally, palpable cancerous nodules in the late stages, a smooth liver surface in diffuse cancer, œdema of the feet usually, cachexia and anæmia marked, no characteristic fever curve, a duration of less than two years, and previous or concomitant carcinoma of other organs.

DIFFERENTIAL POINTS.—In hypertrophic cirrhosis the jaundice is deep, cachexia is less marked, and liver surface is smooth. In syphilitic amyloid liver with projecting gummata there is a syphilitic history and there is less cachexia. A large, *nodulated hydatid liver* is recognized as such by puncture.

Treatment.—Palliative treatment by hypnotics and sedatives is all that we can offer our patient at the present time. Whenever there is an element of doubt as to syphilis, an inunction course should be tried. Loeffler, of Germany, has recently recommended inoculation of malarial poison against carcinosis, and Beaton, of England, reports that carcinosis in women can be influenced by removing their ovaries. The influence of animal extracts and of x rays on carcinosis is still unknown.

HYDATID CYSTS OF THE LIVER (ECHINOCOCCUS)

The cyst is formed by the larvæ of tænia, is unilocular or multilocular, and gives no marked symptoms in its incipient stage. A large cyst may present as a fluctuating swelling. If situated to the left of the suspensory ligament, pressure on the heart may result. The cysts may perforate any neighboring hollow organ. When suppuration in the cyst takes place, pyæmic symptoms supervene. The hydatid fremitus is a diagnostic sign in echinococcus cysts. In simple cysts the general health may be good. When hydatid cysts rupture or are punctured, urticaria often develops from absorption of irritating fluid.

Differential Points.—In order to distinguish between hepatic abscess, carcinoma, and hydatid cyst, a puncture is necessary. Multilocular cysts and carcinoma cannot be distinguished without puncture. Dilatation of the gall bladder and hydronephrosis have been mistaken for echinococcus cysts. An examination of the puncture fluid will reveal the condition present. Hydatid cysts have been mistaken for right sided pleurisy. The puncture fluid of echinococcus shows albumin and free fluid containing hooklets. Sterile cysts contain no hooklets, and cysts which have been irritated may show albumin in the fluid.

Treatment.—Medication and injections into the cyst are useless. When simple aspiration fails to cure, incision is indicated.

CHRONIC DEGENERATIVE PROCESSES IN THE LIVER

The conditions to be briefly described under this heading have more of a pathological than clinical interest, inasmuch as they represent pathological incidents in the course of various systemic diseases.

Atrophy of the Liver may result from all forms of cachexia or marasmus. The liver is small.

Fatty Degeneration is observed in poisoning by phosphorus and in acute infections. The liver is small.

Fatty Infiltration is often associated with general obesity and severe anæmia. It is quite common in children in gastroenteric and other acute infections. The liver is enlarged.

Amyloid Liver is observed in the cachexia of chronic suppuration, chronic malarial disease, chronic gout, syphilis, leucæmia, and pseudoleucæmia. The liver is enlarged.

In all these conditions a consideration of the underlying cause leads to the diagnosis, gives the prognosis, and indicates the treatment.

Syphilis of the Liver.—In congenital syphilis of the liver we observe diffuse infiltration, gummata, and chronic induration (syphilis hereditaria tarda). In acquired syphilis, the diffuse infiltration and gummata are present.

The TREATMENT is antisyphilitic and sustaining.

DISEASES OF THE GALL BLADDER AND BILE DUCTS

ACUTE CATARRH OF THE BILE DUCTS (NOT CAUSED BY GALLSTONES)

This inflammation is due to an extension of gastroduodenitis from indigestion, infection, or passive congestion. The cardinal symptoms are jaundice and indigestion. If the jaundice persists longer than three months, an exploratory laparotomy may be indicated in order to locate and remove if possible a serious obstruction. Otherwise, the *prognosis* is favorable and the *treatment* is that of catarrhal jaundice.

Acute Inflammation of the Gall Bladder is an infection of this organ, with or without the presence of gallstones. The *symptoms* are those of *hepatic colic*, *paroxysmal pain*, oftentimes *jaundice*, *local tenderness*, *fever*, *nausea*, *vomiting*, *abdominal distention* and *rigidity*, and *general prostration*.

The *differential points* in diagnosis will be discussed under Gallstones. In doubtful cases a probatory puncture into a palpable swelling or distended gall bladder is indicated, or an exploratory laparotomy is demanded.

TREATMENT.—Mild manifestations of gall bladder inflammation may subside under the application of a hot water bag to the parts, a brisk cathartic, and subsequently morphine subcutaneously to quiet pain. When the symptoms become urgent and suppuration and sepsis are suspected or are evident, the treatment becomes surgical. An operation is required in nearly all cases of empyema or dropsy of the gall bladder and in persistent *recurring colic from inflammatory adhesions*. Aspiration through the abdominal walls will not affect a cure and is hazardous. The choice of operation after opening the seat of disease lies between cholecystotomy, cholecystectomy, and cholecystenterostomy, and must be left to the judgment of one who is experienced in this class of surgery.

GALLSTONES

Concrements from bile are deposited generally in the gall bladder and occasionally in other parts of the bile tract in and outside of the liver. They occur in all sizes and numbers. They are composed of cholesterin, lime salts, bilirubin, etc. Normal bile is sterile and is kept sterile by a centrifugal flow of bile. Microbial invasion may take place through the circulation during typhoid fever and grippe or by way of the intestines. This invasion of microbes is favored by a stagnation of bile, viz.: an atrophic condition of the gall bladder from old age, gravidity, and tight lacing.

Microbial invasion produces catarrhal conditions of the lining of the gall ducts. Epithelia with undissolved cholesterin are detached and form centres of crystallization or deposit, and the nucleus or starting point of gallstone formation is thus afforded. Concrements in the gall ducts do not invariably irritate, but they frequently give rise to pain, inflammation, adhesions, abscess, and perforation.

The microbic theory of gallstones is now an established fact. It is probable that the microorganisms favor the precipitation of certain elements of the bile, but the microbes cause a catarrh, which may not be recognized clinically. The degeneration of the epithelial cells produces the cholesterin and lime.

Lithiasis is a result of the infection of the whole biliary tract or of the gall bladder alone.

Calculi may be divided into two classes—those produced by the colon bacillus and those by the typhoid bacillus. The colon bacillus is the most frequent cause. The presence of aseptic foreign bodies in the gall bladder does not produce inflammation and does not seem to affect its function, if the cystic duct remains patent. There is no precipitation of cholesterin when the bile remains clear and free from microbes.

Bile, stagnant in an aseptic gall bladder, has no tendency to precipitate. It is probable that the microorganisms find their way into the gall bladder through the duodenal opening of the common bile duct. The possibility of entrance through the blood vessels must be allowed, but has not been proved.

If the ductus cysticus becomes occluded, we observe dropsy of the gall bladder or eventually empyema with ulceration and perforation into the liver, intestine, stomach, or peritonæum. Malignant growths often find a foothold on perforating ulcers. Cholelithiasis and carcinosis are companions.

Gallstone colic is associated with great pain, vomiting, fever, and occasionally jaundice. Spasmodic contraction of the gall ducts produces pain just as we observe it in the ureter and intestine. Children are not subject to gallstones and women are more subject than men.

Symptoms, Diagnosis, and Differential Points.—As long as a calculus remains free in the gall bladder no urgent symptoms are produced. When impaction occurs in the cystic or common bile duct, urgent symptoms are manifest. Colic is the main symptom, accompanied by nausea, vomiting, sweating, a rapid pulse, depression, and frequently, but by no means invariably, jaundice, for an impacted gallstone need not entirely obstruct the flow of bile.

As a rule there is fever of an indefinite intermittent type during an attack of gallstone colic. The pain of biliary colic is acute and cutting and is localized in the region of the gall bladder, whence it spreads over the abdomen, thorax, and back and frequently into the right shoulder. The liver and gall bladder are tender, particularly if the hand is pushed beneath the free border of the thorax.

The duration of an attack varies; it may be over in an hour or two, and with remissions and exacerbations may last a week or two until the stone is expelled. Impaction in the cystic duct may develop without jaundice and may distend the gall bladder into a palpable tumor which, unlike a wandering kidney, moves with respiration. Occasionally gallstone crepitus may be perceived. As a result of cystic duct impaction, we observe dropsy of the gall bladder or inflammation and empyema of the gall bladder. In case of perforation by the stone, a localized abscess or general peritonitis may ensue.

COURVOISIER'S LAW.—Of distinct value in practical diagnosis is the observation of Courvoisier, made in 1890, in regard to the enlargement of the gall bladder from obstruction of the common duct. The law is this: When the common bile duct is obstructed by a stone, the gall bladder does not enlarge, whereas when the obstruction occurs from other causes, enlargement is generally present. In explanation of this anomaly it is suggested that if there is a stone in the common duct, there are probably several others in the gall bladder, the presence of which excites inflammatory action, this in turn being followed by a contraction of the tissue walls of the viscus.

Impaction in the common duct gives rise to jaundice and symptoms of catarrhal and suppurative cholangeitis. There is an intermittent presence of bile in the stools, occasionally fever, and some enlargement of the liver. The gall bladder may be distended or atrophic.

DIFFERENTIAL POINTS.—A colic as described, plus jaundice and a history of previous attacks, makes the diagnosis of gallstone almost positive. After an attack the stools should be passed through a rotating flour sieve and search made for the stone.

In localized paroxysmal pain without jaundice we must discriminate from the following conditions: In inflammation and adhesions of the gall bladder without stone the absence of stone can be made out only at the time of operation (Morris' spider cases). In *renal colic* the pain radiates from the lumbar region into the lower abdomen, groin, thigh, and testicle. The lumbar region is often tender on pressure and the urine may show blood, hæmoglobin, and calculi. In *gastralgia* the pain is in the middle epigastrium and radiates more to the left; fever and jaundice are absent, and no gallstones are found in the stools. In *appendicitis* the pain is localized over the appendix, the appendix is tender on palpation, jaundice and tenderness of the liver and gall bladder are not observed, and a gallstone is not found in the stools after the attack. In *enteralgia* or *intestinal colic* the pain is in mid-abdomen and is relieved by pressure and the passage of flatus. Jaundice is absent and stones are not found in the stools.

Complications and Sequelæ.—Gallstones may be expelled at *irregular intervals*, with symptoms of colic not urgent enough to demand operative interference, and a cessation of the symptoms may result. Stones of all sizes may *pass* or *ulcerate* into the *bowels* and be discharged with the stools. Very large stones may cause *intestinal obstruction*. Stones may ulcerate and perforate into any *neighboring organ* or *locality* and produce abscess, fistula, or peritonitis.

Treatment.—The prompt way of relieving the intense pain of gallstone colic is to give a hypodermic injection of morphine (gr. ¼ to ½), to be repeated if necessary. The patient may also place a hot water bag over the seat of pain and drink hot peppermint tea. In lieu of hypodermic medication the following prescription for internal use is offered:

℞ Morphin. sulph., ... gr. j;
Chloroformi,
Pulv. acaciæ, } āā, ... ʒj;
Aquæ, ...ad., ℥iij.
M.: ft. emuls. et adde,
Syr. sacch., ... ʒjv.
S.: A teaspoonful every half hour until the patient is relieved.

After the attack the bowels must be kept open by Carlsbad salts or enemata.

The indications for operative treatment vary with each individual case. The age of the sufferer is to be considered. Patients with a senile heart are not promising subjects for operative interference. An exploratory laparotomy in doubtful cases is better than theoretical speculation. If after opening the abdomen the conditions are found to be favorable for radical operative measures, they should be employed. An operation performed while the stones still remain in the gall bladder or cystic duct gives the best results.

MORTALITY AFTER OPERATIONS FOR GALLSTONES*

1.	237	Conservative operations (cystostomies, cystendyses, cysticotomies), with 5 deaths	2.1 per cent
2.	161	Cystectomies, with 5 deaths	3.1 "
3.	137	Choledochotomies, with hepaticus drainage, with 9 deaths.	6.5 "
4.	114	Simultaneous operations on the stomach, intestines, pancreas, liver, kidney, etc., with 24 deaths	21 "
5.	71	Simultaneous operations in "inoperable" carcinoma of the gall bladder, choledochus, liver, diffused suppurative cholangeitis, diffused suppurative peritonitis, sepsis, with 69 deaths	97 "
		Total: 720 laparotomies, with 112 deaths	15.5 per cent

Deducting (4) 114 operations, and
(5) 71 operations.

*535 Uncomplicated laparotomies for gallstones, with 19 deaths, 3.5 per cent. —Professor Hans Kehr, of Halberstadt, Germany, 1902.

CANCER OF THE BILIARY APPARATUS

Cholelithiasis and *carcinosis* are companions. Cancer of the gall bladder, if primary, is almost invariably associated with gallstones. Frequently it is secondary to cancer of the liver and neighboring organs.

Symptoms.—Pain, tenderness, chronic jaundice, fever, cachexia, hæmatemesis, etc. Sometimes a tumor can be felt. A positive diagnosis is made by exploratory laparotomy. The disease is fatal.

DISEASES OF THE PANCREAS

GENERAL REMARKS

The pancreas is situated in the curve of the duodenum, across the first and second lumbar vertebræ, and is extraperitoneal. It occupies the region from six to twelve centimetres above the umbilicus. The gland is of the compound racemose type and secretes a very active digestive fluid. This fluid consists of four well known ferments, acting upon separate classes of food: Trypsin, acting upon the proteids, changing them into peptones; amylopsin, acting upon the starches, converting them into maltose and then into glucose; rennet, coagulating the milk when in the presence of an acid; and steapsin, emulsifying the fats and changing them into soap. The amount of pancreatic secretion in a case of Cushing's was found to be as high as 660 grammes daily, and all was not then obtained. This is a much larger amount than was formerly believed to be secreted by the gland The curve of the amount secreted was greatest during the day and decreased as the night advanced and the upper intestines were emptied. This action corresponds with the belief that food stimulates the flow of the pancreatic secretion. The nerve supply is probably through the pancreatic, but the mode of action is not definitely known. The sympathetic system may also be found to have some influence, because the amount of secretion varying with the amount of food to be acted upon in the intestines indicates a close nervous relation between these organs.

Hæmorrhage into the pancreas is one mode of sudden death. The patients are previously well and are taken with sudden severe epigastric tenderness and pain, increasing in severity and colicky in character. Nausea and vomiting usually follow, and the patient becomes anxious and restless. The pulse is weak and rapid and later becomes imperceptible. The temperature is that of shock, normal or subnormal. Tympanites is sometimes marked. The bowels are usually constipated. The diagnosis is certainly most difficult, and if it is made, surgical relief would be indicated.

ACUTE HÆMORRHAGIC PANCREATITIS

Acute inflammation accompanied with small hæmorrhages into the interlobular tissues usually occurs in males with an alcoholic history. The onset is sudden, with violent colicky pain in the upper abdomen, nausea, vomiting, and collapse. Constipation is the rule. The abdomen becomes swollen and tense. The temperature is at first low, then high. Delirium usually accompanies the attack. The condition must be distinguished from acute *perforative peritonitis* and *intestinal obstruction.*

Treatment.—The treatment would be symptomatic. Prescribe rest in bed, unload the bowels, apply cold over the abdomen, and order a fluid diet.

ACUTE SUPPURATIVE PANCREATITIS

The inflammation may occur as a single focus or as diffuse suppurative foci. The symptoms are not clear, but are usually of some duration. The attack may come on suddenly with severe pain, vomiting, fever, and delirium. A deep seated mass may be felt in the median line above the umbilicus. This may be accompanied by an attack of jaundice and fatty diarrhœa, with or without sugar being present in the urine. When glycosuria has been present, destruction of the islands of Langerhans has been found at the necropsy.

Treatment.—The treatment would be surgical.

Gangrenous inflammation of the pancreas may follow any of the following conditions: *Acute hæmorrhage, acute inflammation, simple or suppurative, injury to the organ, and perforative ulcer of the stomach.*

The whole or a portion of the organ may be involved, and the disease may terminate in death or recovery in two or three weeks.

DIAGNOSIS.—The diagnosis of the condition would depend upon the history and symptoms, which are very much like those of suppurative pancreatitis.

TREATMENT.—The treatment of such a condition would be surgical.

Chronic inflammation of the pancreas is usually associated with a chronic catarrhal process of the stomach, duodenum, or bile ducts, and is an extension through the ducts. A few cases may follow syphilis, alcoholism, and general arteriosclerosis. The inflammation may be hæmatogenic, due to toxines in the blood, and hence follow typhoid fever, influenza, or some other toxæmia. If infection is the cause, prolonged drainage of the *gall bladder* has been recommended.

Atrophy of the organ is usually associated with diabetes, or chronic interstitial inflammation of the head of the gland, or a blocking off of the ducts.

TUMORS OF THE PANCREAS

Tumors of the pancreas are usually carcinomatous, rarely sarcoma, adenoma, lymphoma, tuberculous, or syphilitic. The head of the organ is usually the seat of the disease, though the body or tail may be involved. The growth usually occurs in people of middle life.

Diagnosis.—The diagnosis of the condition is not often possible, as there are no regular symptoms and the growth may be present without symptoms. The most common association of symptoms is the following: Rapid cachexia and pain, which may be continuous or paroxysmal and situated in the epigastrium. Nausea and vomiting may coexist. Jaundice, from occlusion of the common duct with distention of the gall bladder, may be severe and increasing. The presence of a tumor is very variable and may or may not be made out. Pulsation, with or without a bruit, may be discovered. Thrombosis of the portal vein and its sequelæ may complicate the condition. Symptoms from loss of function are not common, hence fatty diarrhœa is not frequent. The stools are clay colored and greasy from the absence of bile. Diabetes is rare. Dilation of the stomach and stenosis of the pylorus from pressure of the growth may exist. If the diagnosis is made early, the only hope lies in complete extirpation of the growth, including all involved glands and tissue; otherwise the outlook is hopeless.

CYSTS OF THE PANCREAS

Cysts are due to inflammation, or retention from occlusion.

The history of one variety involves blows or oft repeated pressure over the pancreas as the existing cause. The symptoms are pain and vomiting and later the pressure of a tumor. Following inflammation there are severe symptoms coming on suddenly with pain and obstruction of the ducts, causing the later development of the tumor. Without preceding trauma or inflammation, there may be cystic formation from retention by plugging of the main ducts, or from proliferation of glandular tissue and occlusion of a duct, or many small occlusion cysts from chronic interstitial changes in the alveoli.

It seems proper to mention here the *pseudopancreatic cysts* due to hæmorrhage into the lesser sac of the peritonæum. Such a condition may follow trauma or inflammation, and resembles in position and symptoms true cysts of the pancreas. The anatomical situation of these cysts is in one of three places: In the lesser sac between the stomach and colon; rarely if ever above the stomach; and between the peritoneal layers of the transverse mesocolon. Thus the physical signs of the tumor will appear in one of these three positions, in the epigastrium, with only slight lateral displacement from the median line.

Irrespective of the anatomical position, the symptoms in general of all of these cysts are similar, though every one is not necessarily present in each instance—attacks of colicky pain, nausea, and vomiting, with progressive enlargement of the abdomen. Fatty diarrhœa is rare, as is salivation. Glycosuria, however, is frequent. Jaundice may occur from pressure obstruction of a duct. Dyspnœa may be present, due to the size of the cyst. In some cases there may be loss of flesh. Sudden temporary disappearance of the cyst may occur, due to the discharge of its contents into the intestinal canal.

Physical signs of these cysts depend, as stated above, upon the anatomical position. Hence the tumor usually appears as a hemispherical bulging in the median line of the upper abdomen, rarely as a lateral tumor. It is immobile and unaffected by deep inspiration. As a rule, the stomach is above and the colon crosses below. The aspirated fluid is reddish or dark brown in color, containing blood, blood coloring matter, and cell detritus, with fat granules. The consistence is mucoid and the reaction alkaline. The specific gravity varies from 1,010 to 1,020. It may contain one or all of the pancreatic ferments, but the digestion of fibrin or albumin is the only reaction regarded as a positive sign. The absence of all ferments is not regarded as negative proof.

The following conditions must be distinguished from pancreatic cysts:

Malignant Tumors	*Pancreatic Cysts*
Pain continuous.	Not usually present until large.
Loss of flesh and strength.	Rarely.
Progressive local and general infection causes a multilocular cyst.	Usually unilocular.
Hardness.	Cystic feel.
Surface nodular.	Smoothness.
Duration of months.	Weeks.

Aneurysm of the Abdominal Aorta	*Pancreatic Cysts*
Expansile pulsation.	Pulsation ceases in the knee-chest position.
Bruit.	
Size diminished by steady pressure.	Not affected by pressure.

Peritonitis	*Pancreatic Cyst*
Fever. Pain. Tenderness.	Symptoms less intense.

Ascites	*Pancreatic Cysts*
Causes for ascites.	History and onset of symptoms differ.
Aspirated fluid gives character.	
Cystic Ovary	*Pancreatic Cyst*
Examination and history.	Digestive disturbances.
Hydronephrosis or Pyonephrosis	*Pancreatic Cyst*
History points to the kidney or ureter.	
Examination of the urine.	
Dulness below the kidney posteriorly.	Tympany in the lumbar region below the kidney.
Echinococcus Cyst	*Pancreatic Cyst*
Peculiar pseudocrepitus.	Not present.
Multilocular.	Unilocular.
Presence of hooklets in the aspirated fluid.	
Retroperitoneal Glandular Enlargement	*Pancreatic Cysts*
Preceding history and other symptoms.	
Cyst of the Suprarenal Gland	*Pancreatic Cyst*
Not possible to distinguish.	

PANCREATIC CALCULUS

This condition is rare and its symptoms are seldom defined sufficiently to make a diagnosis. The concretions are usually multiple and resemble fragments of white coral. In substance they are carbonate of calcium.

The symptoms, if present, are due for the most part to the effects of the stone on the gland; hence we observe a chronic interstitial inflammation of glandular substance with dilatation of the duct. This condition may go on to the formation of cysts. There may be acute suppurative inflammation of the gland. The irritation of the deposit may be followed by carcinoma. Under the foregoing conditions, the symptoms leading to suppuration from stone would be severe colic, fatty diarrhœa, and glycosuria without other explanation.

SURGERY OF THE PANCREAS

The advance of pancreatic surgery has been greatly hindered by the difficulties of diagnosis and by the great danger attendant upon operation on this gland, particularly from leakage of the pancreatic secretion, which seriously irritates the peritonæum.

The results of operations in chronic pancreatitis are encouraging.

DISEASES OF THE PERITONÆUM, OMENTUM, AND MESENTERIC GLANDS

The *peritonæum* is the inner lining of the abdomen and pelvis, and is reduplicated at various points so as to partially or completely envelop the various intrapelvic and intraabdominal organs.

Clinical Varieties of Peritoneal Inflammation.—The clinical varieties are ascites (hydroperitonæum), acute peritonitis (diffuse and localized), subphrenic abscess, chronic peritonitis, diffuse and localized (simple, tuberculous, syphilitic, gonorrhœal, and malignant).

Peritonitis is an inflammation of the peritonæum, and on opening the abdomen in such cases we find clear or cloudy or hæmorrhagic effusion, creamy or foul pus, and plastic lymph deposits, and in case perforation of the intestine has taken place we may find fæcal matter in the abdominal cavity.

Clinically, we recognize *acute*, *subacute*, and *chronic peritonitis* with periods of quiescence and periods of exacerbation of inflammatory symptoms. Peritonitis may result from injury with infection (including imperfect surgical technique), from an extension of an inflammatory process of a neighboring organ with or without perforation, and from metastasis through the blood and lymph channels in all infectious and septic processes. We have evidence of prenatal peritonitis in the shape of intraabdominal adhesions and bands. In the new-born septic peritonitis may develop from the navel. In childhood and adult life severe enteritis, appendicitis, typhoid ulcer, tuberculosis, trauma, and infection are the exciting factors in peritonitis.

When the causative factor is unknown, we speak of idiopathic peritonitis. In the present state of our knowledge this term is too indefinite and unsatisfactory and had better be dropped.

ACUTE PERITONITIS

A primary, or idiopathic, peritonitis is supposed to occur as a terminal event in chronic nephritis, arteriosclerosis, and gout. Acute primary infection is theoretically as likely as the infection of any other serous membrane through the blood, but practically almost all of our cases of peritonitis are secondary, viz.: By extension of a neighboring inflammation, by perforation of gastrointestinal ulcers (simple, tuberculous, cancerous, stercoraceous, or typhoid, or due to intestinal stone), by rupture of any neighboring pus sac, as in appendicitis, pyosalpinx, and by pyæmic infection (puerperal infection).

Symptoms.—When the patient is already ill and a slow spreading general peritonitis develops as a complication, the onset may be sudden or slow and insidious. The pain becomes general, the abdomen tender, distended, and tympanitic, and the patient's knees are drawn up to minimize abdominal tension. The respiration is costal and rapid (30 to 40), vomiting may be persistent (green vomit), and the pulse is rapid and small (110 to 150). The temperature may be normal or subnormal or high. The urine contains much indican, and there is a tendency to collapse. The face is anxious, the skin is cold, and the mind may be quite clear. On examination the abdomen is found motionless or rigid, and on auscultation we may hear peristaltic restlessness, or in case of intestinal paresis we notice an absence of intestinal gurgling. The hepatic dulness soon disappears and an effusion may become manifest.

Differential Points.—In severe enterocolitis simulating peritonitis there is profuse diarrhœa with only moderate meteorism and abdominal rigidity. In intestinal obstruction there is no decided rise of temperature, no passage of flatus or fæces, and fæcal vomiting generally occurs. The high temperature and rigid abdomen are marked only in the later stages. In rupture of an ectopic gestation sac there is a characteristic previous history—no fever, breast signs, menstrual irregularities, with a small pulse and collapse after the rupture.

Acute localized peritonitis occurs principally in three varieties: Pelvic peritonitis, peritonitis around the appendix, and subphrenic peritonitis or abscess. Pelvic peritonitis is discussed under Gynæcological Memoranda. Appendicular abscess is discussed under Appendicitis.

Treatment of Acute Peritonitis.—The management of acute general peritonitis depends upon circumstances and the underlying cause. Hot water or ice bags may be applied locally over the abdomen and full doses of opium may be given by the mouth, or morphine (gr. $\frac{1}{4}$) and atropine (gr. $\frac{1}{150}$) subcutaneously. The diet should be diluted milk, slimy gruel, white of egg in water, tea, peppermint tea, champagne, water ice, ice cream, tropon, ʒj to a cup of tea, and ice to suck.

If vomiting persists, rectal alimentation must be relied on, and one drop of tincture of iodine should be given in a teaspoonful of sweetened peppermint tea every hour. The lower bowel may be flushed with a pint of warm saline solution once or twice a day. When the infection is widespread, it may become necessary to open the abdomen and flush with hot salt water. There are no strict rules to guide us as regards indications for operative interference in diffuse peritonitis; each case must be judged upon its merits. A localized peritonitis and abscess formation require prompt incision and drainage. As a heart stimulant, camphor in oil, subcutaneously, or benzoate of sodium and caffeine, subcutaneously, is indicated.

The PROGNOSIS in diffuse peritonitis is grave. The pulse is the best index to the gravity of the infection. A rapid pulse and incessant vomiting and high septic temperatures, all combined, give a fatal outlook.

SUBPHRENIC PERITONITIS (ABSCESS)

A *subphrenic abscess* is an accumulation of pus between the liver and the diaphragm or between the stomach, the spleen, and the diaphragm.

Causation.—Perforation of a gastric or duodenal ulcer. Upward extension of any intraperitoneal inflammation or abscess, or any form of suppuration taking its origin in the liver, gall bladder, stomach, spleen, circumrenal tissue, pancreas, appendix, intestine, hydatid cysts, or trauma. Downward extension of an empyema through the diaphragm. In some instances we have to deal with a subphrenic abscess containing air—*pyopneumothorax subphrenicus*.

Subphrenic abscess occurs in adults and in children. The writer has seen two instances in children, one taking its origin from the perforated appendix in a girl of five and the other from a perforation of the ascending colon, left side abscess, in a girl of ten. Both patients recovered after an operation.

Symptoms of Subphrenic Abscess.—The symptoms may come on abruptly or insidiously. In addition to the general symptoms of sepsis, such as fever, chills, and rapid pulse, there are localized pain and tenderness, vomiting, and embarrassed respiration. There may be bulging of the tissues on the side in which the abscess is located. Sometimes a succussion sound may be elicited. If the abscess contains air, there will be an area of tympanitic percussion sound between the liver and lung. Aspiration under such conditions may bring forth *foul smelling air instead of pus*. Often a swelling with local œdema is noticeable. A friction sound may be heard over the complementary pleural space (9th to 11th rib). If there is much pus, the liver dulness will extend unduly upward. Similar phenomena will be elicited on the left side, minus the liver dulness. Eventually the subphrenic abscess may rupture into the thoracic cavity and communicate with a bronchus. In suspected cases aspiration should be done in the 7th or 8th interspace in the mid-axillary line or immediately above the supposed liver dulness.

Prognosis.—The prognosis is grave. Early recognition and prompt operation and drainage may save life. Incision should be made over the centre of the dull area or wherever the probatory puncture reveals pus or foul air. As a rule a resection of the 8th, 9th, or 10th rib in the mid-axillary line will be indicated, or an incision in the interspace between the 7th and 8th ribs in the anterior axillary line. Should this lead into the free thoracic cavity, a second puncture downward may be made in order to locate the pus.

CHRONIC PERITONITIS

The peritonæum may participate in the chronic inflammatory condition of organs in contact with it (localized chronic peritonitis) and may suffer by reason of chronic infection of the serous membrane itself, resulting in diffuse *adhesive peritonitis*. Apart from cancer and tuberculosis, a proliferative chronic peritonitis is described by Osler, which is found in chronic alcoholism and possibly in syphilis.

The symptoms are persistent abdominal pain of a colicky character and occasionally intestinal obstruction due to fibrous bands. On opening the abdomen in such cases, the coils of the intestines are found matted together, the peritonæum is thickened, the omentum forms thickened masses, and a serous effusion may be present.

The most interesting form of chronic peritonitis is the *tuberculous* variety, which is seen more often in children and is described in the pædiatric section of this book.

CANCER OF THE PERITONÆUM AND OMENTUM

This is usually secondary to malignant disease of the abdominal or pelvic organs, and is observed in persons past middle life. There is persistent ascites or bloody effusion, with loss of flesh and cachexia, and large nodules are felt on palpation.

Differential Points.—*Tuberculous peritonitis* occurs mainly in children. *In hydatid disease* hooklets may be found in the puncture fluid. In doubtful cases an exploratory laparotomy is to be done. Cancer of the peritonæum is incurable. Morphine and opium should be given to allay the pain.

THE OMENTUM AND MESENTERY

These structures frequently participate in whatever befalls the peritonæum, and thus we observe syphilis, tuberculosis, and cancer of the omentum, the diagnostic features of which have been discussed.

Cysts of the Omentum or Mesentery containing a brownish fluid have been observed. *Hydatid cysts are rare.*

The TREATMENT is by aspiration and laparotomy.

Thrombosis of mesenteric blood vessels gives symptoms of peritonitis.

MESENTERIC AND RETROPERITONEAL GLANDS

The lymph nodes in this region may become acutely inflamed or may undergo tuberculous, syphilitic, or malignant degeneration.

Tabes Mesenterica, a tuberculous glandular enlargement, presents a distinct clinical picture and may be associated with tuberculosis of the peritonæum and intestine. Children suffering from this disease are puny, anæmic, and wasted, with a large tympanitic abdomen, diarrhœa, and fever. In cases difficult to diagnosticate the tuberculin test may be employed. A blood examination is of value, also a temperature record extending over two to three weeks. Indentable scybala should not be mistaken for enlarged glands.

The **prognosis** is uncertain.

The **treatment** is that of tuberculosis in general.

CHAPTER XI

THE CIRCULATORY SYSTEM

SYNOPSIS: Remarks on the Clinical Pathology of the Circulation.—Congenital Heart Defects.—Clinical Aspects of Hypertrophy and Dilatation.—Acute Circulatory Failure (Heart Strain, Shock, Collapse).—Endocarditis.—Pericarditis.—Pericardial Adhesions. (Continued in Next Section.)

REMARKS ON THE CLINICAL PATHOLOGY OF THE CIRCULATION

AN efficient circulation is of fundamental importance to the organism and depends upon the condition of the motor (heart) and the elasticity of the vessels. Vasomotor influence is exerted in such a manner that normally one organ may be hyperæmic and another anæmic without disturbing the general circulation. There is also an aspirating mechanism furnished by the right heart and the lungs, supplemented by the contractions of muscles and fasciæ. Owing to a well recognized reserve power, the accommodation of the heart muscle to the various demands made upon it is very complete in health. Great and continued expenditure of force is followed by hypertrophy of tissue, just as in the skeletal muscles. Thus, any impediment to the circulation, be it located in lungs, kidneys, liver, or blood vessels, will put a strain upon the heart and produce hypertrophy, that is, more heart muscle, in order to overcome the resistance. The so called reserve power in the heart is present in hypertrophic hearts as well as in normal hearts, although not in the same degree. When arterial pressure is permanently increased, there is danger of rupture of capillaries (on exertion), particularly in arteriosclerosis.

Unusual heart fatigue and heart strain may be followed by *distention or dilatation of the heart.* Recovery from distention may take place sooner or later, but occasionally a heart is thus permanently damaged. Heart strain is particularly dangerous in chronic degeneration of the heart muscle or following acute infectious fevers, such as typhoid or diphtheria, and in pertussis, etc.

The position and size of the heart are made out by means of inspection, percussion, palpation, auscultation, and direct vision through the agency of x rays. Such knowledge must be acquired at the bedside and cannot be learned from books. In transposition of the viscera the heart is sometimes located on the right side (dextrocardia). In a rhachitic thorax the position and size of the heart cannot be judged if the left nipple is taken as a guide. In such cases it is best to take our measurements from the midsternal line.

The lungs cover the heart and large blood vessels, excepting a part of the right ventricle. The area of the uncovered heart is called the area of superficial dulness; that of the whole heart, the area of deep dulness. The heart is movable. Thus, the apex beat and heart dulness will move to the left if the patient's body during examination tilts to the left side; and it does not always mean enlargement if the apex beat is to the left of the nipple. In many people no apex beat, or heart shock, is felt. The term cardioptosis is occasionally used in connection with a heart which by reason of a laxity of attachment is very movable.

In order to determine the borders of the heart, the lungs and pleura must be clear. The diameter of the heart is greater during forced expiration than during inspiration. The size and position of the heart and the decrease in size of a dilated heart improving under treatment may be observed by means of the Röntgen rays.

The *pulse* should be felt at both wrists to see if it is synchronous. Auscultation of the heart and examination of the pulse at the same time will distinguish between systolic and diastolic phenomena. The pulse may be slow, rapid, intermittent, arrhythmic, small, large, or trip hammer. An imperfect heart systole may manifest itself as an intermittent pulse.

Murmurs.—Regarding *murmurs,* it may be remarked that not all systolic murmurs mean a valvular lesion, and thus we speak of *accidental* murmurs and of *functional* murmurs. We hear musical, rough, soft, blowing, scraping, and vibratory murmurs. In children accidental murmurs are comparatively rare.

Accidental heart murmurs are as a rule systolic and offer no direct indications for treatment, as they are not connected with organic changes in the valves, papillary muscles, or chordæ tendineæ.

Diminution of heart pressure and transitory disturbances of the motor function of the heart may cause temporary insufficiency of a valve and produce a heart murmur (*functional murmur*).

Pericardial friction sounds may be mistaken for heart murmurs. A murmur may make its appearance during illness and subsequently disappear completely. Heart murmurs which disappear on holding the breath are of *cardiopulmonary origin,* and not endocardial.

When the heart beats rapidly, as in fever, heart murmurs may disappear or accidental murmurs may arise; therefore, heart sedatives may be given for *diagnostic purposes* to reduce the forcible and rapid action of the heart and bring out murmurs if present. A murmur that accompanies the normal heart sound is of less gravity than one that replaces it.

The pulmonic second sound is accentuated when there is pressure behind the valve, but such phenomena are also observed in the normal hearts of neurotic individuals.

Reduplication of the sound indicates that valve action is not simultaneous or is out of time, or the heart strain is present (nephritis). A reduplication of the first sound is frequently heard when there is high arterial tension, as in aortic stenosis or kidney disease.

The most satisfactory way of auscultation is the direct one. The stethoscope is an aid to the dull ear, however.

As the *size of the liver* and its *tenderness* are important guides to the degree of venous stasis, they should always be ascertained in connection with an examination of the heart, as also the examination of urine. When albumin and casts are found in heart insufficiency it becomes important to know which is *primary*, the heart or kidney trouble. This may be ascertained by a careful weighing of all the evidence, and thus the treatment will be better directed.

In *heart weakness*, or *insufficiency*, a complicating hydrothorax is often present and overlooked. The removal of fluid from the thorax in cases of overwhelming heart strain is often followed by subjective relief and lasting improvement.

In children the heart beat is often rapid and occasionally intermittent, even in sleep, and the rapid pulse has not the same significance as in adults. A slow and irregular pulse, particularly following infectious disease, is of graver import in children and justifies a guarded prognosis.

In speaking of murmurs the author prefers to use the terms *systolic* and *diastolic*, not being convinced of any gain in clinical clearness by using the term presystolic.

Summary.—The influence of a *weak heart* on the general circulation may be summed up as follows: When both sides of the heart are equally or unequally reduced in tone and power, we observe venous stasis with at first functional disturbance in the lungs, liver, kidneys, stomach, and brain, with their train of symptoms: Dyspepsia, dyspnœa, local pain, vertigo, palpitation, etc., with a terminal *dilatation* and *collapse of the heart*. Whereas a moderate *valvular defect* is of importance as regards *accommodation*, a *dilatation* has a serious pathological importance. *Venous stasis* gives a well recognized clinical picture. Cyanosis and turgid veins, with and without pulsation of the jugular and other veins, cardiac dyspnœa, and hyperæmia of the liver and lungs, with a tendency to catarrh and hæmorrhage and fluid accumulations in dependent parts and cavities, are the components of venous stasis. Cardiac dyspnœa is probably due to swelling and rigidity of lung substance from congestion.

Heart insufficiency, or *heart weakness*, may be due to muscular insufficiency or valvular insufficiency or to both combined.

It may be *primary* or *secondary* to other diseased conditions which obstruct the circulation. This distinction has clinical importance, and if the underlying cause of circulatory weakness, or heart strain, can be removed, the heart may regain its integrity.

In dealing with the patient the terms "*weak heart*" and "*faulty circulation*" are preferable to the terms *heart disease* or *valvular heart disease*, from the humane standpoint. The *element of fear of sudden death* which we find in the laity when heart disease is spoken of plays an important part in the management of such cases, and the physician may be well aware of the exact anatomical nature of the disturbance without unnecessarily alarming and harming his patient.

CONGENITAL HEART DEFECTS

Children are born with divers heart lesions, such as *patency of the foramen ovale*, *patency of the ductus arteriosus*, *defect in the ventricular septum*, and *lesions at the pulmonary orifice*. Prematurity seems to be an ætiological factor.

Symptoms.—Cyanosis, dyspnœa, cough, convulsions, œdema, and great restlessness. In some cases murmurs or intermittent murmurs and an increase of the dull area of the heart are found on examination. In other cases the physical examination is almost negative. Cyanosis is not always present.

Treatment.—We are unable to cure an anatomical defect of the heart. When blue babies, by reason of constant suffering, cry day and night, it is necessary to administer a sedative, such as chloral hydrate and potassium bromide, to put the child to sleep, and use as occasion demands. Some of these patients die during infancy, others succumb to some intercurrent disease during childhood, and some grow to maturity.

CLINICAL ASPECT OF HYPERTROPHY AND DILATATION

ENLARGEMENT OF THE HEART

Enlargement of the heart may be due to simple hypertrophy or to dilatation or to hypertrophy and dilatation combined.

Simple hypertrophy of the heart is the direct result of heart strain on a heart muscle not markedly degenerated, and it depends upon three factors: The duration of the strain, the degree of the strain, and the condition of the heart muscle.

Enlargement may affect the entire organ or one side or only one chamber. The changes are most frequent in the left ventricle, because it does the principal work in pumping the blood through the body.

We speak of a primary, or idiopathic, hypertrophy, when it occurs in neurotic individuals who have a continued rapid action of the heart following the abuse of tobacco, beer, or prolonged heavy work (athletes) and in gravidity. Any strain upon a skeletal muscle makes it hypertrophic; it is just so with the heart muscle.

We distinguish eccentric and general hypertrophy. Idiopathic hypertrophy is a specimen of general enlargement.

Hypertrophy is frequently secondary to arteriosclerosis, nephritis, hepatitis, emphysema, pericardial adhesions, and valvular defects; in fact, any chronic obstruction to the circulation is followed primarily by hypertrophy, which influences its function and ends in dilatation of the heart muscle.

In ordinary hypertrophy the heart weighs from 500 to 600 grammes. Weights up to 1,500 grammes have been reported, but they are rare.

Symptoms and Physical Signs.—Hypertrophy is a conservative process and often gives no symptoms, but frequently there is a sense of fulness, with flushing, headache, palpitation, and forcible shock without palpitation. In arterial degeneration with hypertrophy of the heart the development of miliary aneurysm in the brain and cerebral hæmorrhage is common. There may be bulging of the pericardium, the area of impulse is increased, and percussion shows increased dulness going to the left of the nipple. This may be absent, however, if hypertrophy increases the heart in the anteroposterior diameter. The pulse is full, strong, and of high tension in cardiac hypertrophy. Enlargement of the heart must be distinguished from mediastinal growths, neurotic palpitation, and hydropericardium. Chronic pneumonia and pleurisy on the left side, by reason of retraction, may "uncover" the heart and give rise to an extensive area of dulness, which may be mistaken for hypertrophy. The latter is difficult to make out in a deformed chest.

A strong, heavy impulse and apex beat denotes hypertrophy. In pericardial effusion the heart shock is not visible and is not felt. The sounds are distant and muffled.

Cardiac hypertrophy is clinically divided into three stages: The period of development, the period of compensation, and the period of decompensation (acute and chronic by dilatation).

Prognosis is a matter of retained compensation. Hypertrophy may be transient from transient causes, such as neurotic palpitation, tobacco, and overexertion, and will require sedative treatment, as with bromide of sodium and laxatives.

Hypertrophy and arteriosclerosis will require careful dietetic and hygienic management in order to prevent, if possible, apoplexy. Otherwise, hypertrophy should be looked upon as a conservative process of nature, and our therapeutic indications are directed to the underlying cause and to the prevention of dilatation of the hypertrophic heart muscle.

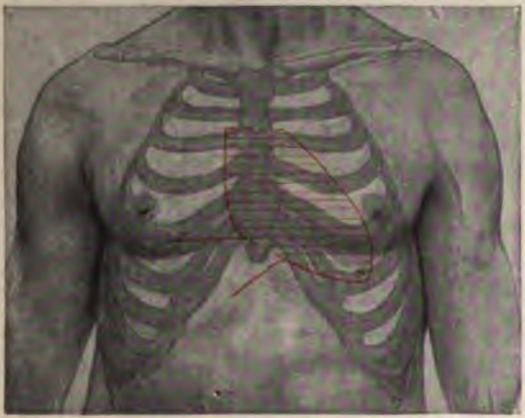

FIG. 115.—DULNESS IN HYPERTROPHY OF THE LEFT VENTRICLE.

Apex beat heaving and carried down and to the left, perhaps outside of the apex outline. Apex pointed.

DILATATION OF THE HEART

High blood pressure and impaired resistance produce dilatation of the heart. Two varieties are recognized: Dilatation with thickening and dilatation with thinning of the heart walls.

Sudden cardiac failure during exertion is due to dilatation of the heart or rupture of a valve. Hearts which have lost their tone from muscular degeneration (infectious fevers or valvular defects), if subjected to severe strain, are apt to dilate. Mental emotion is supposed to be one of the causes of idiopathic dilatation. In pericardial adhesions the heart is apt to dilate. Dilatation is the opposite of hypertrophy and causes heart weakness.

Physical Signs.—Diffused impulse, weak muffled sounds. Dilatation may be accompanied by a murmur, and the heart sounds may be absent. The pulse is small, weak, quick, and intermittent. On auscultation we hear embryocardia, or gallop rhythm. Murmurs formerly present may disappear and murmurs may set in and disappear as the heart becomes stronger. This is due to relative insufficiency, not to valvular lesion. One of the earliest signs of dilatation is an irregular and intermittent pulse.

Hypertrophy and dilatation are often due to overexertion and alcohol, as in heavy beer drinkers.

During severe muscular effort, when the heart is strained to its utmost, as in mountain climbing, *acute dilatation* may result. A sense of distress is felt and a feeling of dyspnœa, which may pass over after a day's rest or may reassert itself on the slightest exertion. We speak of such a person as "wind broken."

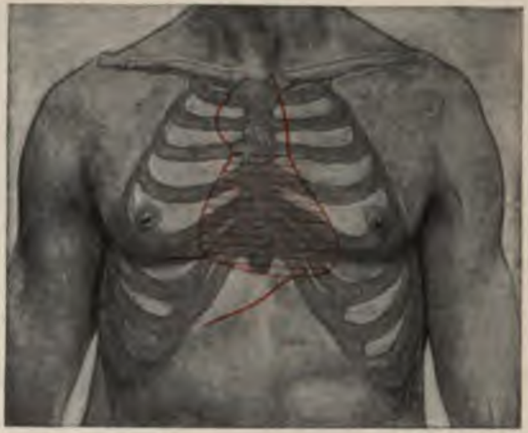

FIG. 116.—SHOWING THE DULNESS DUE TO DILATATION AND HYPERTROPHY OF *Both Ventricles*.

Apex rounded and apex beat diffused.

Dilatation of the right heart may be recognized by the location of the impulse, which is below or to the right of the ensiform cartilage. The apex beat may be absent on the left side. Pulsation to the right or left of the sternum in the second and third interspace is looked upon as an evidence of auricular dilatation.

The **management** of circulatory failure due to dilatation of the heart will be considered in the chapter on Valvular Heart Disease.

In *acute dilatation* from overstrain absolute rest in bed must be enjoined.

ACUTE CIRCULATORY FAILURE (HEART STRAIN, SHOCK, COLLAPSE, RUPTURE)

A sound and a damaged heart may suffer acutely in various ways, viz.: from direct injury, embarrassment due to compressed or rarefied air, entrance of air into the right heart, embolism of the pulmonary artery, severe hæmorrhage, shock or nervous depression, and the various septic and chemical poisons, anæsthesia, and mechanical obstruction to the heart's action from pericardial effusion. It is nothing unusual for a senile heart to come to a stop from shock or from the effects of an operation or from an attack of acute gastroenteritis. A sudden heart death in convalescence following septic diphtheria is no uncommon circumstance.

The heart's nourishment depends so much upon its own proper function that any depressing circumstance which lowers the blood pressure in the aorta and coronary arteries may be of great moment. The rapidity with which sudden circulatory failure sets in gives the patient barely time to state his distress; consciousness fails, the face turns blue, the extremities are cold, the pulse fails, and death supervenes sometimes in a convulsive seizure. In subacute cases the collapse passes over and the circulation under proper management gradually improves.

The **treatment** of acute collapse is its timely prevention, of which we shall speak under the management of the various diseases which provoke it. In cases of acute collapse in which death is not instantaneous the prompt attention of the physician may save life. Lower the head, loosen the clothes, employ artificial respiration, hold ammonia to the nose, give salt water hypodermically or per rectum, or administer strychnine, camphor, whiskey, and digitalis internally or hypodermically (see chapter on General Therapeutic Management). The gradual progressive insufficiency of the heart noticeable in so many diseases is best combated by absolute rest and such other measures as are discussed under their various headings.

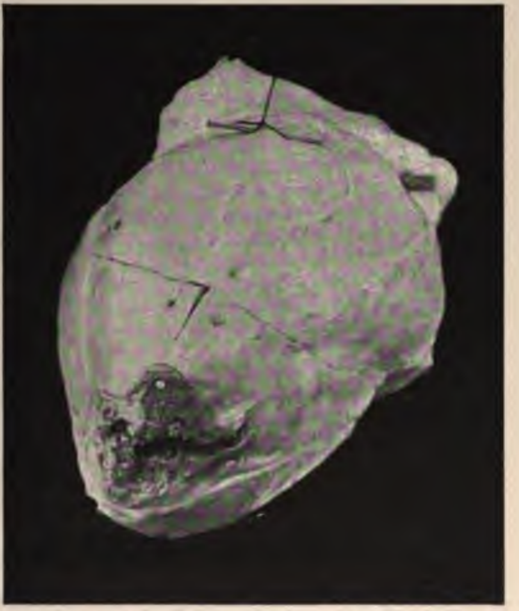

FIG. 117.—RUPTURE OF THE HEART (Dr. R. H. Newton).

ENDOCARDITIS

Endocarditis is an inflammation of the inner (lining) membrane of the heart. Rheumatism or any other infectious disease may constitute the causative factor. We distinguish acute and chronic endocarditis.

ACUTE ENDOCARDITIS

Acute endocarditis is recognized clinically as simple, malignant, septic, and verrucose. The simple form is one of the associated features of acute rheumatic fever, and is occasionally met with in scarlet fever, so called tonsillitis, typhoid fever, pneumonia, and chorea.

Bacteria, the causative factor of infection, for some reason or other find a foothold on the endocardium, usually in the left heart, and the ensuing hyperplastic or destructive inflammatory process is very apt to result in permanent damage to the valves of the heart.

A somewhat similar but much severer form of endocarditis occasionally follows gonorrhœal infection or gonorrhœal rheumatism. The most fatal form is septic or ulcerating endocarditis, all forms presenting but different degrees of intensity of the same process, but possibly of different microbial origin. The lesions are vegetative, ulcerative, or suppurative, and the sequelæ are embolism and infection of other tissues and organs.

Diagnosis.—There is nothing characteristic in an onset of endocarditis. When in the course of rheumatic arthritis there is an exacerbation of fever, with a rapid, unsteady heart, with or without increase of joint symptoms, endocarditis may be suspected. If, in addition, a murmur is now heard in a heart which was free before, we are very apt to diagnosticate endocarditis, bearing in mind, however, that accidental murmurs are heard over the heart during febrile disease, but may disappear and leave an intact heart. There may be sweating, chills, delirium, petechiæ, and embolic processes, with the symptoms pertaining to them, such as coma, paralysis, local pain in some other organ, bloody sputum, bloody urine, and retinal hæmorrhage, or localized gangrene.

Some types of endocarditis, particularly the chronic form, *resemble irregular intermittent fever.* Others have the cardiac or cerebrospinal symptoms pronounced. Jaundice has been observed, also oppression and short breathing, cardiac pain, and great restlessness. Each case must be judged upon its own merits, and no definite general diagnostic landmarks are possible.

The acute septic form, which frequently terminates fatally, may complicate septicæmia from erysipelas, puerperal fever, and gonorrhœa. The milder forms usually recover with a damaged valve. One of the great achievements to be hoped for in practical medicine would be the prevention of endocarditis in chorea, eruptive and other fevers, gonorrhœa, tonsillitis, diphtheria, etc.

Treatment.—Absolute rest; warm baths; cooling drinks; an ice bag to the heart. In the septic form the management is the same as for any other sepsis, viz., elimination and stimulation. Treatment by antistreptococcus serum is in its experimental stage.

In acute articular rheumatism with high fever, rapid heart, and pronounced restlessness, it seems rational to combine a heart sedative with sodium salicylate as follows:

℞ Sod. salicyl., ... ʒij;
Potass. iodid., ... ʒss.;
Tinct. aconiti radic., }
Tinct. verat. virid., } āā, ... gtt. x;
Aquæ, ... q. s. ad. ℥ij.

M. S.: A teaspoonful, with sugar, every two hours, for children;

the dose for adults must be larger. Apart from internal medication, Credé's ointment may be rubbed into the skin, ʒj three times daily.

It is, furthermore, of the utmost importance that in the treatment of rheumatic cases routine flushing of the bowel with warm saline solution be practised, in order to eliminate, if possible, the danger of intestinal toxæmia or secondary infection from the enteric tract.

CHRONIC ENDOCARDITIS

Chronic endocarditis is a slow, insidious process, secondary to acute endocarditis or superinduced by various irritants and infections, such as syphilis, gout, alcohol, and *malaria*—together with prolonged muscular strain. This process results in thickening and contraction of valves, usually in the left heart. It may be observed in children and it is common in middle aged individuals. When the valves are affected and the heart's equilibrium is disturbed, the first complaints are heard, and subsequently the course and management are those of chronic valvular disease. Alcoholism, syphilis, malaria, and rheumatic infection are the predisposing factors. Syphilis and malaria require specific treatment and change of climate. Persons living in unwholesome abodes must be told that sunshine, cleanliness, and fresh air are the best preventives against acute and chronic infection.

PERICARDITIS

Definition and Ætiology.—*Pericarditis* is an infection and inflammation of the pericardium, usually secondary to an inflammatory process of a neighboring serous membrane. As in pleurisy, we have a dry pericarditis or one with serous or purulent effusion with and without adhesions. Rheumatism, all forms of sepsis, the eruptive fevers, Bright's disease, typhoid fever, diabetes, scurvy, and tuberculosis are provocative of pericarditis.

Pericarditis is not rare in children as a sequel of rheumatism or scarlet fever.

Dry pericarditis is recognized principally by its *friction sound*, to and fro, corresponding to the systole and diastole of the heart. This friction sound is superficial and close to the ear, and there are no definite lines of transmission, as in endocardial murmurs, although it must be admitted that occasionally it is difficult to distinguish a friction sound from a double murmur. Dry pericarditis is of limited duration, but it may persist and result in a chronic thickening of both layers of the pericardium. There is no typical fever curve in this ailment.

Pericarditis with effusion may develop without characteristic signs, although præcordial distress, pain on pressure over the heart, and dyspnœa are the rational symptoms. Patients so afflicted have an anxious countenance with a paradoxical pulse, which becomes lost or faint during inspiration. These symptoms are the direct result of embarrassed heart's action. From pressure upon the trachea and œsophagus we may have aphonia, cough, dysphagia, and venous stasis. Insomnia, delirium, and coma are observed in severe cases.

The *physical signs* of massive pericardial effusion are bulging of the chest and of the intercostal spaces, occasionally œdema of the chest wall, diminution and obliteration of the cardiac shock, dislocation and loss of the apex beat, and an irregular, pear-shaped increasing heart dulness, with a broad downward base. With absorption of the fluid the friction sounds return. When an onset of pericarditis is suspected, the heart dulness should be carefully marked with a blue pencil. Pericarditis is often overlooked or mistaken for pleurisy.

The **prognosis** depends upon the underlying cause and is favorable in the simple variety. Septic cases are usually fatal; the purulent variety not necessarily so, as the pus may be absorbed or is amenable to surgical interference.

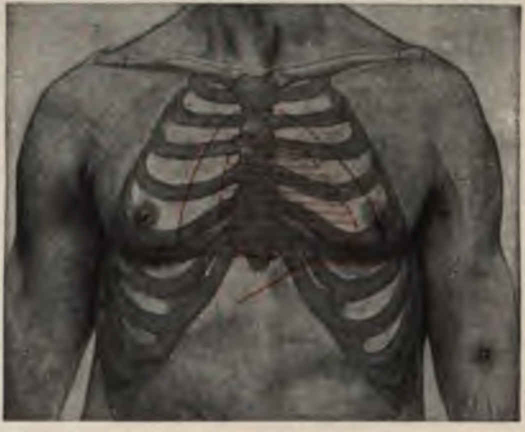

FIG. 118.—THE TRIANGULAR AREA OF DULNESS DUE TO A *Large* PERICARDIAL EFFUSION IS SHOWN BY THE OUTER SOLID LINE.

For comparison the normal cardiac dulness is shown by the inner shaded area. Note position of apex beat with reference to the pericardial dulness.

Differential Points.—It is sometimes extremely difficult to discriminate between dilatation of the heart and pericarditis with effusion. Cases occur in children in which it is difficult to distinguish between encapsulated pleuritic effusion and pericarditis and effusion, the needle showing a serosanguinolent fluid. Cases have been reported in which purulent pericarditis was mistaken for encapsulated empyema.

Hydropericardium (Dropsy of the Pericardium) occurs in connection with general dropsy and presents the signs of pericarditis with effusion. *Chylopericardium* is a term used in cases of chylous effusion. *Hæmopericardium may result* from rupture of an aneurysm or from injury. *Pneumopericardium* may result from a stab wound, etc.

Treatment of Pericarditis.—A stiff dose of calomel and jalap is appropriate at the start of almost any ailment. Rest in bed should be enforced. An ice bag to the heart or a blister or dry cupping is indicated. In adults complaining of severe pain a morphine injection over the seat of pain may be advisable. Credé's silver ointment (15 per cent of silver to one ounce of fat) may be used to counteract sepsis. It is administered by inunction, ʒj ter in die.

If syphilis or malaria is suspected as an underlying cause, potassium iodide may be administered by the rectum, or a few doses of quinine may be given by the mouth. The salicylates are indicated when a rheumatic origin is the most plausible. The fewer drugs, the better for the patient. Five drops of dilute hydrochloric acid in sweetened water, after eating, will aid digestion. The diet must be light with plenty of water. Feverish patients generally enjoy a warm bath. In massive effusion, with severe pressure symptoms, aspiration may be necessary with subsequent incision and drainage if pus or seropus is found. The puncture should be made in the fourth or fifth interspace, one to one and a half inches to the left of the sternal margin (see article on Dropsy and Effusion).

Suppurative pericarditis secondary to pleuropneumonia, empyema, osteomyelitis, and other septic processes, typhoid fever, influenza, trauma, etc., requires surgical treatment. The mortality is about 60 per cent. Resection of a portion of the fifth rib under local or general anæsthesia is the proper procedure. Puncture is not sufficient.

ADHERENT PERICARDIUM; CHRONIC ADHERENT PERICARDIUM

Pericarditis with adhesions which hamper the heart's action.

Symptoms.—Systolic depression of the intercostal spaces and fixation of the apex beat. In adhesions between the pericardium and chest wall the area of cardiac dulness remains the same on inspiration and expiration, and the heart is usually enlarged. Adherent pericardium may be universal or partial, following pericarditis of all forms. The symptoms are indefinite, although in children, with their flexible thorax, systolic retraction of the apex region with diastolic rebound and diastolic collapse of cervical veins is noticed. Accidental blubbering murmurs are also heard and the *pulsus paradoxus* is observed. Adherent pericardium is sometimes associated with a systolic retraction in the eighth or ninth interspace on the left side posteriorly (Broadbent's sign).

Treatment.—Nothing in the way of irritating restrictions should be inflicted on the patient. Apart from constitutional treatment nothing can be done.

CHAPTER XII

THE CIRCULATORY SYSTEM—*Continued*

MUSCULAR AND VALVULAR INSUFFICIENCY OF THE HEART AND HEART NEUROSES

SYNOPSIS: Weak and Flabby Heart.—Fat Laden Heart.—Degeneration of the Heart Muscle without Valvular Defects: Senile, Gouty, Syphilitic, Fatty, Fibroid Heart, Myocarditis with Constant Arrhythmia.—Valvular Heart Disease and Muscular Insufficiency.—Heart Neuroses.

WEAK HEART; CONGENITALLY SMALL HEART; FLABBY HEART MUSCLE

IT is a well known clinical fact that some individuals have a small heart; thus, most people with tuberculosis or tuberculous tendencies have small hearts. It goes without saying that persons not afflicted with tuberculosis may have a small heart. Such persons look anæmic, are easily tired, and have palpitation on slight exertion, particularly if they increase in weight. These patients present all the clinical evidence of moderate heart insufficiency, and may show a slight puffiness at the ankles.

The **diagnosis** is made by exclusion. So called "neurasthenic" heart weakness with its long train of symptoms is often nothing more than motor weakness.

Treatment.—An insufficient heart which will stand a strain will improve by reason of such strain and increase in motor force; therefore it is the duty of the physician to overrule the laziness and indolence of that class of patients whose heart symptoms are not due to degenerative processes by ordering *active exercise.* It must be explained to the patient that palpitation and moderate dyspnœa do not contraindicate active exercise. This must be particularly impressed upon corpulent women who feel faint, dizzy, and languid after exertion and are very prone to accept rest instead of motion. It is in this class of cases that graded climbing, outdoor and indoor exercise and gymnastics, and a judicious dietary will work wonders. The details of such management will be discussed under Fat Laden Heart.

Weak heart from cardioptosis is described as a relaxation of the elastic tissue of the large vessels which allows the heart to prolapse, that is, hang much lower in the thorax than normal. This prolapse causes the apex beat to appear beyond the nipple line, and makes the lower part of the area of relative and absolute heart dulness much wider than normal. The pathognomonic sign of the existence of this anomalous condition is the absence of heart dulness at the ordinary upper limit of the organ. As the result of the cardioptosis such symptoms as respiratory anguish, painful dyspnœa, and præcordial discomfort develop. Some of the cases of angina pectoris are said to be due to this condition. The cause is always an hereditary tendency to relaxation of tissues and seems to be a family trait. Apart from general tonic management there is no special *treatment* for such a condition.

THE FAT LADEN HEART (COR ADIPOSUM)

Fat people frequently present the clinical evidence of heart weakness, and in the absence of a murmur, we are apt to diagnosticate "fatty heart." In all such cases we must endeavor to distinguish between fatty degeneration and the fat laden heart of obesity. In obesity and fat laden heart much can be done by rational management. Corpulent individuals are sluggish in their movements. They have dyspepsia from mechanical interference with respiration, later on from true fatty infiltration of the heart muscle; the liver becomes large and fatty. Œdema, intertrigo, and eczema increase the suffering of the patient.

Treatment.—The indications for *treatment* are reduction of the amount of food and oxidation of the fat already stored. *Persons who have a tendency to corpulency should be warned in time.* To reduce weight we have the Banting, Ebstein, Schwenninger, and Oertel systems (see Nutrition and Diet). The latter regulates diet and gives attention to the heart and circulation by systematic exercise, and is as follows:

Oertel recognizes two classes of cases: 1. Corpulency without respiratory and circulatory disturbance. 2. Corpulency with respiratory and circulatory disturbance. The oxidation of fat in the body is accomplished by massage, exercise in a gymnasium or in the open air, walking, mountain climbing, cycling, horseback riding, rowing, using the punching bag, playing tennis, etc. Turkish baths may be used, also the purgative waters of Carlsbad, Marienbad, Vichy, and Kissengen or their salts. Liquids should be restricted and none taken with a meal. Turkish baths and violent exercise are contraindicated when the heart is damaged, as in the second class of cases. Walking is the best exercise, and climbing must be done gradually (terrain cure of Oertel).

Thyreoid treatment, probably by increasing oxidation, has given good results in a number of cases of obesity. From 3 to 5 grains of the dry powdered gland may be given three times a day. Should palpitation and disturbance of the cardiac rhythm supervene, its use must be stopped, but dieting and exercise should be continued.

SPECIMEN DIET IN OBESITY

A. M.—Six ounces of coffee or tea, 3 ounces of bread.

Noon.—Eight ounces of meat or fish of any kind, salad, vegetables, 2 ounces, fruit, 3 to 6 ounces, bread or pudding, 3 ounces; wine for those who are accustomed to it, but no beer.

Evening.—Two eggs, 4 ounces of ham or raw meat, bread, cheese, salad, fruit, tea or coffee.

Water is to be taken between meals. The diet should be generous as to variation. The menu should be liberal in quality, but the quantity should not exceed 2,000 calories. One should eat one third less than under ordinary circumstances and not attempt to reduce fat by a special kind of food. The same rule holds good for children. In corpulency with the muscles or valves damaged, and as the consequence, congestion in various organs or arteriosclerotic changes, the greatest care must be taken in advising exercise. The physician must feel his way, so to say, and not force the patient into a regimen which may bring him into danger from bursting of a capillary vessel or from acute dilatation of the heart. Good common sense will direct the management, which can only be outlined in the absence of a specific case.

The total daily amount of water should be limited to from 36 to 48 ounces (including tea, coffee, and wine), except in very hot weather, when more can be taken. Sweets of all kinds are to be avoided as much as possible.

CHRONIC DEGENERATION OF THE HEART MUSCLE NOT DUE TO VALVULAR DEFECTS

Various terms are used to designate such condition, viz.: *Senile heart, gouty heart, syphilitic heart, myocarditis with constant arrhythmia, fatty degeneration, fibroid heart*, etc.

Any acute infection, such as diphtheria, typhoid or rheumatic fever, scarlatina, etc., may be the starting point of the chronic inflammatory process in the heart muscle. Chronic infections, such as syphilis and malaria, are causative factors; and gout, diabetes, atheroma, alcoholism, pernicious anæmia, chronic intestinal putrefaction, toxæmia, and overwork are frequent causes. In fact, any nutritional change which blocks up the blood supply of the heart may result in softening and degeneration of the heart walls. The chronic form generally supervenes upon sclerosis of the coronary arteries. They are terminal arteries, and become blocked with a gradual onset.

Anatomically we observe induration, softening, calcareous, hyaline, fatty, and amyloid degeneration with general or localized dilatation. Clinically we cannot distinguish one form of degeneration from the other, their symptoms being alike.

Symptoms of Muscular Degeneration of Whatever Nature.—Dyspepsia; palpitation; præcordial distress; arrhythmia; anginoid, syncopal, apoplectic, or epileptoid attacks; a short, unsustained, rapid, or regular or irregular pulse; cold extremities; dropsy; and great weakness. The heart eventually dilates, and a murmur may be heard, due to ventricular dilatation. Sudden death after a full meal is not infrequent.

The area of the heart dulness may be normal unless degeneration has affected a hypertrophic heart. Attacks of aphasia often present themselves when sclerosis is present.

Prognosis.—We cannot cure this condition, but by careful management we may prolong life for an indefinite time. A person with myocarditis may drop dead suddenly or live for many years.

THE SENILE HEART AND ARTERIOSCLEROSIS

In late life and without any history of previous disease the heart is often found enlarged, and an active or relative weakness of the myocardium is the origin of the symptoms of the senile heart, such as præcordial anxiety, unstable action, weak impulse, intermission of the beat, subjective throbbing (which may be physical or emotional), cardiac asthma with and without exertion, tremor cordis, fluttering, loss of appetite, fainting, a feeling of weakness, albuminuria, and a feeling of insecurity.

Senile diseases are always degenerative and tend to abridge the natural term of life, and our object is to relieve symptoms and check decadence. Senile cardiac failure is based upon impaired metabolism.

Heart Insufficiency due to Syphilis belongs to the group. There are no special pathognomonic symptoms in heart syphilis; early symptoms are not pronounced. Its prevention is more readily accomplished than its cure. When the usual subjective symptoms bring the patient to the physician and anamnestic data point to an underlying syphilis as a causative factor of myocardial weakness, an antiluetic regimen must be instituted. It is in this class of cases that potassium iodide is powerful for good. As the heart's action is increased and depressed by nervous influence, it is unwise to worry the patient by keeping him constantly under strict supervision.

Principles of Treatment of the Various Forms of Chronic Muscular Degeneration.—The patient must be moderate in eating, drinking, and exercising. No special diet is necessary (except in obesity). The food should be plain and whatever the patient may like, *except* Swiss cheese, pork (lean ham allowed), roast goose and duck, fatty sausage, pastry, rich dishes, hard vegetables, cabbage, sauerkraut, peas, white beans, string beans, and lentils. Beer should be forbidden as apt to produce flatulence and indigestion. There should be five hours between meals, and the main meal should be in the middle of the day. Fluids should be taken sparingly between meals. A little whiskey in water is rather beneficial. Ginger ale is a good drink. Five to ten drops of dilute hydrochloric acid in water after meals will aid digestion. The patient may rest before and after eating. A mild smoke is not objectionable. The bowels should move daily. General massage is advisable. Venesection is often of great value. A warm, cleansing bath may be taken as often as necessary. Iodide of potassium is indicated in syphilitic myocarditis. The indications for heart drugs are discussed under Valvular Heart Disease.

VALVULAR HEART DISEASE

The heart is liable to functional and structural derangements, many of which can be recognized clinically, and among the latter the valvular defects play an important rôle.

A *valvular defect* is of accommodative importance. A derangement in the mechanism of the cardiac valves places an obstacle in the way of the outward flow of blood. To maintain the circulation under these conditions, the heart necessarily enlarges by hypertrophy of the myocardium. As a sequel and correction of valvular insufficiency or obstruction *Nature furnishes us with compensatory hypertrophy of the heart muscle*, but muscular degeneration and *dilatation* manifest themselves earlier in the damaged heart than in the strong heart, and shorten the tenure of life. The action of the heart is increased and depressed by *nervous influence;* worry and anxiety act unfavorably upon the heart and particularly upon a damaged heart; therefore, *don't worry the patient by keeping him continually under strict supervision and treatment.*

The various valvular defects do not influence or disturb the circulation in a like manner, but clinically this is more of prognostic than therapeutic import. We have no separate treatment for the individual sets of valves, and an exact valve diagnosis cannot always be made, nor is it absolutely necessary as regards treatment. Treatment really begins when the hypertrophic heart muscle becomes insufficient and the heart is unable to empty itself.

The estimation of valvular insufficiency or obstruction as a problem of hydrostatics is easier than the estimation of the loss of elasticity of muscle or the reserve power of the heart. The prognosis as to tenure of life in cardiac disease is therefore somewhat uncertain.

Signs and Symptoms of Valvular Lesions

Aortic Stenosis.—*Systolic murmur* in the aortic area at the right edge of the sternum, in the second or third space, is transmitted upward to the right sternoclavicular articulation or may be heard along the right edge of the sternum lower down; occasionally it is accompanied by a *thrill,* particularly if it follows rheumatic fever. *Functional systolic murmurs* in this region are also heard in anæmia, in *anæmic individuals convalescent from acute illness;* in *impaired flexibility of a valve without stenosis in middle age,* and in *dilatation of the aorta just above the valves.*

The DIAGNOSIS will depend upon the history, the aspect, the age, and the absence or presence of concomitant symptoms. A loud murmur indicates strong ventricular action. In actual obstruction we observe cardiac hypertrophy and deranged circulation, and a low and forcible apex beat, the pulse wave being long and slow and the pulse small. In actual obstruction of the aortic valve the mitral valve may suffer severe strain and become incompetent, which is a downward step in the evolution of the disease.

The PROGNOSIS is not so serious as in aortic incompetence, but more serious than in mitral incompetence. Sudden death from it is improbable.

Aortic Incompetence.—A *diastolic murmur* in the aortic area is sometimes heard in the third left space and may be *conducted downward to the apex.* There is *violent arterial pulsation,* particularly in the carotid and brachial arteries. *Pulsatile reddening* of the skin is noticed when a red patch on the skin is brought out by friction. *Capillary pulsation* is also noticed from various causes, producing a low tension pulse. The pulse is a *collapsing water hammer pulse* (*Corrigan*), and has a peculiar double beat. In advanced cases the pulse is irregular and the aortic second sound, if looked for over the carotid in the neck, is absent. Concomitant stenosis modifies the pulse signs. There will be in addition to hypertrophy, dilatation of the left ventricle, with a marked apex beat displaced downward and to the left and lifting of the chest wall. Other symptoms are breathlessness, syncopal attacks, anginal attacks, and præcordial pain. Sudden death is apt to occur. Mitral regurgitation may coexist.

Prognosis.—When the lesion is not due to degenerative changes in the heart, and the signs and symptoms already enumerated are mild, the patient may enjoy life for many years, and much will depend upon age, habits, occupation, and the time of life when the lesion was acquired.

Aortic insufficiency may be due to endocarditis, of syphilitic, rheumatic, or malarial origin, and possibly to prolonged strain (athlete's heart). A relative insufficiency due to dilatation of the aortic ring is rare.

Mitral Regurgitation.—There is a *systolic murmur* at the *apex* or beyond the apex, toward the axilla, often heard at the back of the chest, between the scapula and the spine, a portion of the ventricle resting upon the spinal column. Occasionally the murmur is heard in the third or fourth space in the vertical nipple line.

Differential Diagnosis.—A systolic aortic murmur is conducted toward the apex. A systolic tricuspid murmur, regurgitation, is lost to the left of the apex and heard between the apex and the lower end of the sternum. *Spurious pulmonic* murmurs due to compression of the edges of the lung by ventricular systole are not audible during expiration.

The pulse in mitral regurgitation is usually irregular in rhythm and force, probably owing to varying pressure during inspiration and expiration. When a murmur is present and the first sound persists, the leakage at the valve may be slight. A loud murmur means a strong ventricle. A musical murmur is sometimes heard. The pulmonic second sound is accentuated, and hypertrophic dilatation of the right ventricle follows. The apex beat is displaced outward to the left with extension of the area of deep dulness. In slight regurgitation maximum symptoms are missing. In severe, advanced cases dyspepsia, dyspnœa, dropsy, and liver enlargement are present.

Functional mitral incompetence without valvular disease may result from anæmia or acute febrile disease. Mitral murmurs are heard in debility and old age.

Hæmocardiac murmurs are usually soft and blowing and do not replace the first sound. They are not conducted to the axilla or back, and there is no displacement of the apex beat. There are exceptions, however. The history of the case is important. Temporary regurgitation in acute rheumatic fever is possible and does not invariably indicate valvular lesion. A mitral murmur associated with chorea and with antecedent rheumatism may be functional and temporary, or organic, and a lengthy observation is often necessary to come to a definite conclusion. Mitral regurgitation—incompetence—may be established imperceptibly in middle and old age, with and without organic valvular alteration. The regurgitation may be the same as in anæmia and flabby heart (relative insufficiency) or may be due to an enlargement of the auriculoventricular opening from dilatation of the ventricle from some form of undue arterial tension.

Prognosis.—This is the least serious and most amenable to treatment of all valvular lesions. Slight regurgitation permits of old age, and women may marry. Dropsy, pulmonary and hepatic congestion, and œdema come and go.

Mitral Stenosis.—This is a more serious form of valvular disease, relatively frequent in women. The murmur is diastolic, the pulse is usually of high tension and regular until heart failure sets in, the heart is enlarged, and the apex beat is displaced to the left and downward in pronounced cases with powerful shock and thrill. The pulmonic second sound is accentuated from back pressure. Three stages may be observed in the evolution of mitral stenosis. In the first stage a diastolic murmur and diastolic sound are heard at the apex; in this stage no serious symptoms are observed. In the second stage the diastolic sound has disappeared and is replaced by a diastolic murmur. This is best distinguished from the systolic murmur of incompetence by feeling for the heart shock at the time of auscultation. A murmur synchronous with the heart impulse is systolic. If we listen at the heart during an attack of palpitation or tachycardia, all murmurs are indistinct, but reappear after the heart is quieted. In the third stage the diastolic murmur frequently disappears, and an exact diagnosis may be difficult. Other symptoms are breathlessness on exertion, dyspeptic symptoms and nausea with a tendency to congestion of the lungs, hæmoptysis and arterial embolism, and enlargement and pulsation of the liver. When decompensation sets in, in combined stenosis and regurgitation, the signs above mentioned fluctuate and the heart's action becomes irregular.

PROGNOSIS.—When mitral stenosis is established in childhood, the prognosis is more serious than when it is established at a later stage. When attacks of delirium cordis, or tachycardia, supervene in mitral stenosis, the patient's life is in great danger from acute pulmonary œdema. A marked case of this kind in the experience of the writer occurred in a young lady of twenty-four whose valvular lesion was acquired at the age of six during an attack of articular rheumatism. Without premonitory symptoms, "heart hurry" would manifest itself usually in the evening or after retiring. Within a short space of time râles could be heard all over the chest, a short cough set in, the dyspnœa became acute, foam issued from the mouth, and finally the patient became blue from carbonic acid intoxication and lay moaning in a stupor. The patient recovered from seven such attacks.

When several valves are affected all sounds may disappear.

Valvular lesions in children present no special difficulty in diagnosis. Dyspnœa on exertion, anæmia, a bluish tinge of the skin and mucosa, clubbed fingers in advanced cases, all forms of dropsy, and congestive symptoms are found—headache, loss of appetite, liability to bronchitis, and bulging præcordia.

Tricuspid Incompetence and Stenosis, when pronounced, are usually congenital.

Tricuspid Regurgitation, with or without a murmur, is usually due to back pressure in the lungs in valvular disease of the left ventricle. The murmur, if present, is *systolic* and heard to the *left* of the *sternum* in the vertical nipple line. It is often mistaken for a mitral regurgitant murmur. The veins of the neck are distended and pulsate, and the damming back of the blood in the vena cava inferior enlarges the liver to a point of pulsation.

Tricuspid Stenosis is usually associated with mitral stenosis. The rational physical sign is a *diastolic murmur* in the *tricuspid area*, with distention of the jugular veins and no pulsation. Dropsy occurs at an early period. This condition may be mistaken for mitral stenosis.

Pulmonic Stenosis is congenital and often associated with a patent foramen ovale and perforated interventricular septum. The *murmur* is in the *pulmonic area* and *systolic*, but such systolic pulmonary murmurs are also heard without change in the orifice and valves, viz.: in anæmia. A systolic murmur in the pulmonary area is occasionally heard in young adults with no other evidence of heart trouble. It is supposed to be due to incomplete covering of the conus arteriosus by the overlapping lung, so that during systole the conus is flattened out against the chest wall, forming an eddy in the blood current and thus giving rise to a murmur. Other congenital malformations are *incomplete interventricular septa, patent foramen ovale, persistence of patent ductus arteriosus, transposition of the pulmonary artery* and *aorta*, and *malformation of the valves*. Children and infants suffering from such malformations are fretful, may have convulsions, do not sleep, have clubbed fingers and toes, are anæmic or cyanotic, remain backward in growth and intelligence, and may or may not have murmurs.

Diagnosis and Prognosis of Congenital Heart Disease

With a *diagnosis* of *congenital heart disease* the *prognosis* is that many die at an early age or of intercurrent disease; some reach eleven, fifteen, or twenty-four years (see Pædiatrics).

Summary of Diagnosis and Prognosis.—The statement will bear reiteration that a cardiac murmur does not constitute a heart lesion. There are accidental and functional murmurs persisting through long life and accidental murmurs which appear during a period of relative incompetency in flabby, anæmic, neurotic, and fatty subjects or overworked hearts and disappear when the heart has regained sufficient tone. A functional intraventricular murmur is systolic in time, half way between the apex and the base. It is not anæmic and not heard in the neck, and it is due to cardiac debility; that is, the papillary muscles fail to contract in unison with the walls of the ventricles. It presents no post mortem lesion and frequently disappears.

When a valvular lesion is strongly suspected and its exact location is doubtful, no anxiety need be felt by the medical man as regards its precise rational treatment, for it is practically the same in all valvular lesions. With an apex beat in normal position and of normal rhythm, no anxiety need be felt regarding a murmur. The cure of a heart lesion should not be set down as hopeless until iodide of potassium has been tried.

Regarding prognosis, each case must be judged on its own merits. Small people bear a valvular lesion better than tall and bulky persons, and women better than men. Worry aggravates all heart cases, also damp living apartments and poverty. Marriage should not be interdicted except in severe forms of heart disease. During parturition women often present various congestive symptoms which pass off after the termination of pregnancy, and twenty years of happy married life are better than thirty years of celibacy. It is well, however, to warn such patients of the danger of repeated pregnancies.

Principles of Treatment

As soon as the diagnosis of valvular heart disease is established, the following considerations come up: No dancing for children, except square dancing. Rest in bed for choreatic children with murmurs. Sunshine and good air for rheumatics, no damp living rooms, removal from malarious regions.

The clinical course of valvular heart disease admits of a division into three stages. The attainment of compensation, full compensation, and loss of compensation. The treatment of such symptoms as arise during the three stages is practically the same for *all varieties of valvular defects.* Until compensation is attained the patient will complain of palpitation, occasional nausea, short breath, and nervousness. *Heart drugs are not indicated at this stage.* The patient must lead a quiet and orderly life and avoid worry and overstrain. Young men should be advised to enter some field of usefulness in harmony with their "weak heart." Severe exercise, such as swimming and violent dancing, should be interdicted. The school work should be less exacting than for the healthy; girls should rest one or two days during menstruation; cool and cold sponge baths are advisable. In the way of exercise walking is advisable; moderate bicycle exercise on *level* ground is permissible. Alcohol, coffee, tea, and articles of food apt to produce flatulence, such as beans, peas, lentils, doughnuts, rich pastry, and Swiss cheese, should be avoided. A narrow diet is not called for. All meats may be eaten except pork, all salads except mayonnaise salads, all cereals, eggs, ham, fruit, and stale bread; water, mineral water, and ginger ale are to be allowed. The stomach should not be overloaded with food or liquids. The bowels should move once a day, or an enema of soap water should be given before the patient goes to bed, occasionally a laxative or brisk purge. Maltine with cascara for children is indicated. Ten grains of blue mass followed by a Seidlitz powder for adults, once a week, may be taken. The underclothing should be of thin wool or linen mesh. Protection from cold is best secured by thick outer coats and wraps.

To aid digestion, 5 drops of hydrochloric acid in sugar water may be taken after each meal, or Horsford's acid phosphate in water. Patients should be warned against great altitudes and Turkish or Russian baths. Long sea voyages are not well borne by damaged hearts. The utmost care should be exercised not to contract typhoid fever from contaminated water and other sources. Typhoid fever and pneumonia give an *unfavorable prognosis* in patients with weak hearts. Anæsthesia in cases of weak heart should be carefully considered. The danger of obesity from indolence and overeating should be discussed with the patient. Tobacco in moderation is not always harmful, and the author knows of a number of patients, including physicians, whose rapid heart quieted down after a mild smoke and who attained an age of fifty to sixty with mitral insufficiency persisting for from twenty to twenty-five years.

When compensation is broken, as shown by marked dyspnœa, dilated heart, irregularity of action, and œdema, the treatment may require *cold baths*, carbonic acid baths, rest in bed with massage and passive motion, depletion by the bowels, or *venesection* when respiration is markedly embarrassed and compression of the upper arm shows the veins standing *out like whip cords.*

Venesection.—A roller bandage is tightly placed around the arm below the shoulder, and the skin over the median vein is disinfected and made anæsthetic by injecting a weak cocaine solution. The skin over the vein is incised for about an inch, and two catgut ligatures are insinuated underneath the bulging vein. The proximal ligature is tied and the bulging vein is then opened; after from six to sixteen ounces of blood have come away, the distal ligature is tied and an antiseptic dressing applied to the wound. Venesection is often a life saving procedure which is too little practised in our days.

Carbonated Baths as they are given at Bad Nauheim appear to exert a beneficial influence on the circulation by slightly stimulating the skin. Such baths can be given in the house by making use of lumps of chemicals that generate carbon dioxide, or better still, by aerating the bath water with carbon dioxide by means of liquid carbon dioxide from a cylinder, now obtainable in all large cities and many country districts, as it is largely used in drawing beer from the cask.* Mild, general massage, practised several times a week, together with passive motion, is a better aid to the embarrassed circulation than any form of bath; of course massage can be employed in connection with hydrotherapeutics.

This bath treatment is carried on for from five to six weeks with an intermission once or twice a week. The temperature of the bath is to be about 95° F. in the first week, and may be as low as 80° F. in the sixth week. The baths are brine baths, 2 pounds of sea salt to 50 gallons of water, gradually increasing in strength to 10 pounds of sea salt to 50 gallons of water. The gas generating chemicals are placed in the bottom of the tub of warm brine.

Resisted Movements and **Carbonated Baths** are combined in the treatment of heart insufficiency as follows:

The patient makes regular voluntary movements, which are resisted by the physician or operator. These movements are quite gentle, and if there should be any weariness on the part of the patient, or his breathing gets to be rapid, an intermission is given until the equilibrium of respiration or pulse is restored.

The movements are simply flexion, extension, adduction, abduction, and rotation of the limbs, neck, and trunk. As a rule, these exercises improve both the heart and the circulation.

Another form of bath for improving the circulation is as follows: The patient remains for ten minutes in a tub half filled with lukewarm to cool water, in which he moves about gently. This is followed by douching with a pailful of cold water, after which the patient is quickly dried and rests on a couch for half an hour and then takes a light breakfast and a leisurely walk. The careful climbing of *moderate elevations* is beneficial in the early stage of valvular lesions, but mountain climbing is decidedly injurious.

Where moderate exercise, baths, proper diet, and massage, with the occasional administration of ten grains each of calomel and jalap or other laxatives, fail to quiet the heart or to aid it in accomplishing its work, we are compelled to make use of drugs.

The **symptomatic management** of heart cases after all physical and simple methods have been tried is as follows:

For *palpitation* in the first and second stage of valvular disease with a strong heart muscle apply an ice bag to the heart, and give sodium bromide, gr. x to xxx, once or twice a day. Prescribe moderate exercise, a cold sponge bath, and tincture of aconite in two drop doses several times a day.

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* Also sold in small metal capsules.

Palpitation in the third stage, with heart dilatation and dropsy, requires venesection and stimulating treatment with digitalis, strychnine, or opium. (See chapter on Dropsy.)

Nausea is a distressing symptom in circulatory failure for which we may administer dilute hydrochloric acid in 5 drop doses after eating, or Horsford's acid phosphate, 30 drops in water, after eating. In some cases a tablespoonful of coca wine after a meal does well.

Anœmia is a prominent feature in many cases of cardiac disease. The patient should live out of doors as much as possible and ***bromo mangan*** in teaspoonful doses twice a day may be taken, or the following prescription:

℞ Acid arsenicos, ... gr. ij;
Ext. digitalis, }
Ext. nux vomica, } āā, ... ʒj.
M. f. Pil. No. 60.
S.: One pill three times a day.

For *hepatic congestion* order rest in bed and give

℞ Podophyllini, ... gr. $\frac{1}{2}$;
Calomel, ... gr. x;
Pulv. aromat., ... gr. ij.

In one dose for an adult followed by venesection and digitalis if necessary.

For *pulmonary congestion :*

℞ Pulv. digitalis, ... gr. j to ij;
Camphoræ, ... gr. j to ij;
Acid benzoic, ... gr. ij to v, in wafer.

Give one such dose three times a day (for adults).

Or

Infusion of digitalis in tablespoonful doses four times a day.

Or

Potassium iodide, gr. x to xx, twice a day in water per rectum.

Or

Strychnine nitrate, gr. $\frac{1}{60}$, three times a day.

Or

Nitroglycerin, gr. $\frac{1}{100}$, three times a day.

For the management of *Dropsy*, see chapter on Dropsy.

In *cardiac dyspnœa* we may administer :

℞ Morphii sulfur, ... gr. $\frac{1}{8}$;
Tinct. strophant., ... gtt. vj;
Spir. frumenti, ... ʒj.
Sig.: Give in one dose.

Or

℞ Ext. digitalis fluid, }
Tinct. opii, } āā, ... ʒij.
Sig.: Two to four drops every three hours.

Iodide of ethyl may be given by inhalation, dose, 30 drops.
Atropine sulphate, gr. $\frac{1}{200}$, may be given subcutaneously.

Or

℞ Spartein sulphate, ... gr. $1\frac{1}{2}$;
Ext. digitalis fluid, ... gr. xv;
Aquæ, ... ad, ℥ij.
Sig.: A teaspoonful every two hours.

In *insomnia* we give

℞ Hydrate chloral,
Sodium bromide, } āā,. . . . . gr. x to xx, at bedtime.

Or

Codeine, ... gr. j to ij;
Urethane, ... dr. ss.
One dose at bedtime.

Or

Hyoscine, ... gr. $\frac{1}{100}$.

Or

Sulphate of morphine hypodermically, gr. $\frac{1}{8}$ to $\frac{1}{2}$.

In *Acute Pulmonary Œdema and Collapse:*

Camphor oil subcutaneously, 15 grains to ʒjv of oil, dose 15 drops every three to four hours.

Digitalis in whiskey subcutaneously.

℞ Ext. digit. fluid, ... ʒj;
Spir. frumenti, ...ad, ʒjv.
Fifteen drops every four hours.

Benzoate of sodium and caffeine, gr. ij to v subcutaneously, every three hours.

CONTINUOUS DIGITALIS TREATMENT.—When that period arrives in which we are no longer able to produce a lasting compensation by rest, dieting, baths, massage, and short courses of medicine, we may make life more comfortable by administering digitalis (four to eight grains of the powdered leaf) on one day once a week, with strychnine and opium between or in combination.

Visceral Neuralgias in Heart Disease Simulating Other Disease

Hepatic congestion with pain or tenderness in the liver and visceral neuralgias in the intestines and spleen simulate local trouble, such as hepatic abscess, appendicitis, or tubal disease. Valvular heart lesions are sometimes associated with excessive menstrual flow, and sometimes with amenorrhœa. Women with heart disease, endometritis, and metrorrhagia combined have suffered serious operations for supposed malignant disease when a mild curettage and a few doses of digitalis or strychnine and opium would have sufficed to make them comfortable.

The *management of heart disease in children* is practically the same as in adults. The dose of drugs must be reduced one quarter or one third.

Résumé

We find practically three groups in cardiac therapeutics: Cases in which no special treatment is required, cases in which excessive growth and strong action call for aconite or veratrum viride, the bromides, etc., and other sedatives, and cases in which the heart falters and needs support, and for which digitalis, used differently according to varying indications, is the principal remedy.

This line of treatment is held to independently of the exact valve which may be affected.

In *functional valvular disorders* the treatment is by rest, graduated exercise, rational diet, and hydrotherapy.

In *heart neurasthenia* we advise active exercise, rational diet, and fortifying baths. Where heart disease has been known to exist for several generations in a family, it is important that the children should be protected, as far as possible, from even the minor infectious diseases. So mild an infection as mumps has been known to cause a serious heart lesion in such susceptible individuals.

NEUROSES OF THE HEART

Disturbances of presumably neurotic origin, independent of central nervous disease or valvular lesions, are very common. For all such neuroses we have special clinical terms, and we speak of *palpitation, arrhythmia, tachycardia* (*delirium cordis*), *bradycardia*, and *anginal attacks*. The source of such clinical phenomena is not readily located. Palpitation and arrhythmia may be perceptible to the patient or only an objective symptom, particularly at times when there is an increased excitability of the nervous system, at puberty and the climacterium and at the time of menstruation. Heart palpitation may set in suddenly from fright and emotion (fire, fear of death, dreams), lasting all the way from a single attack to recurrent daily attacks, extending over one to three years. In neurasthenics the slightest cause will send the heart up to 150 beats, with a feeling of "goneness," dyspnœa, and a pallid countenance. On the other hand, arrhythmia may disappear after exertion even in valvular lesions.

In all obscure neuroses of the heart which apparently do not improve by diet and by physical methods of treatment the patient should receive the benefit of the doubt and undergo a mild course of antisyphilitic or antimalarial treatment.

Simple Palpitation

In simple palpitation the examination of the heart is usually negative. In neurasthenics and anæmics a murmur is frequently heard.

Prognosis.—The prognosis in simple palpitation is good. Occasionally a patient with what is thought to be simple palpitation will develop some organic heart lesion.

Treatment of Simple Palpitation.—The patient must be told that he has simply a nervous heart and that the exercise of will power will overcome nervousness. The bowels should move once a day, and dilute hydrochloric acid (gtt. v to x) may be given in water once a day to aid digestion. The diet should be liberal, but the following articles should be avoided: Beans, mayonnaise dressing, fried oysters or fried fish, and anything apt to produce flatulence. Alcohol, tea, coffee, and tobacco usually aggravate the neurotic heart to palpitation, but there are exceptions to this rule, and the wise physician will individualize regarding such restrictions.

Cool sponge baths, cold to the heart region, massage, walking, bicycling, punching bag exercise, and horseback riding are indicated, also moderate up-hill walking, a change of scene, comedy, and light literature for the morbid. Static electricity and vibration treatment (see Chronic Constipation) will aid in overcoming palpitation, and women with a lax abdomen and some degree of organ displacement (enteroptosis) should wear a support or binder.

In the way of drugs, bromide of sodium may be given in ten to thirty grain doses twice a day. The underlying cause of palpitation, be it obesity or indigestion or neurasthenia or anæmia or exophthalmic goitre or brain disease or cardiac or renal insufficiency or respiratory insufficiency or sexual excitement, must be investigated. When we have a clear picture of simple neurotic palpitation or palpitation symptomatic with reference to other complaints, we shall know how to treat it.

Arrhythmia of the Heart

We find disturbance of rhythm from many causes, e. g., from organic heart disease and from the abuse of tobacco, coffee, tea, alcohol, and digitalis. We find it in chlorosis, in syphilis and malaria, in gastrointestinal putrefaction, in intestinal, hepatic, or renal colic, in urogenital ailments, in disease of the brain and cord or of the cardiac plexus, and from great mental worry or great fatigue. Most neurasthenic individuals have an irritable heart.

Arrhythmia of the heart may occur normally as an expression of the influence of respiration upon the heart (in sleeping children). The dropping of a beat is common in cases of senile heart, coffee heart, and tobacco heart, and particularly in cases of heart muscle degeneration. The fœtal heart rhythm is indicative of dilatation of the heart. Tremor cordis (fluttering of the heart) and gallop rhythm occur in arteriosclerosis. Thus, we may have temporary or transient and, habitual arrhythmia which is described by the patient as a sudden spasm giving rise to a disagreeable sensation.

The significance of arrhythmia is occasionally difficult to determine and depends entirely on the underlying cause. It may persist for many years in individuals who are apparently in fair health. Arrhythmia may be true and false. In the former the heart beat is actually dropped, in the latter the heart beat is regular, but the pulse is dropped.

Treatment of Arrhythmia.—Digitalis is not indicated in simple arrhythmia without dropsy. We treat or remove the underlying cause if it can be found. In arrhythmia and slow heart following infectious disease, camphor, ether, strychnine, and other stimulants are to be administered.

In the arrhythmia of old age the heart will want stimulants, such as alcohol, strychnine, and opium. The patient should rest after eating, and should eat a little at a time and frequently. Moderate exercise, country life, avoidance of worry, occupation of the mind, reading, and playing cards and other games are to be recommended. In painful arrhythmia, strophanthus is suitable.

In serious forms of arrhythmia depending upon organic heart disease or valvular or muscular insufficiency or upon some unknown permanent disturbance of heart innervation, the treatment will be stimulating, sedative, or specific, as the case may be. The bowels must be kept free, the skin active, and the tongue clean. If syphilis cannot be excluded, potassium iodide per rectum is indicated. Warburg's tincture or arsenic is called for in suitable cases.

Tachycardia (Paroxysmal Rapid Heart)

In paroxysmal rapid heart, or tachycardia, the attacks come suddenly in hearts apparently sound as well as in damaged hearts. Alcoholics are subject to tachycardia, also the offspring of alcoholic parents.

In typical cases the heart's action is so rapid that the pulse cannot be counted. The temperature in the attack is usually normal, and the patient is pale and of an anxious expression and unwilling to lie down on account of dyspnœa; some are able to be up and about.

Treatment.—Apply cold to the region of the heart and give bromide of sodium (ʒj) internally or morphine (gr. ¼ to ⅙) subcutaneously, or ethereal tincture of valerian, in twenty drop doses, and subsequently pay attention to any discernible underlying cause. During the attack there is usually considerable flatus, which can be relieved by the rectal tube. After the termination of an attack we should endeavor to elicit and treat the underlying cause. In the intervals of attacks hydrotherapeutic management should be faithfully carried out.

Bradycardia

Bradycardia, or slow heart, may be pathological or normal. Some individuals have a very slow heart's action. It is seen in the puerperal state, in convalescence from infectious disease, probably from exhaustion, in cachexia, jaundice, cholæmia, fainting spells, in anæmia, diabetes, seasickness, poisoning from opium, fibroids of the uterus, disease of the central nervous system, sunstroke and heat stroke, exhaustion, and hunger. Straining at stool gives rise to a slow pulse, as does cervical injury and occasionally an epileptic seizure.

Symptoms.—The symptoms vary with the underlying cause.

Treatment.—Treatment is directed to the underlying cause and is stimulating. If it is from exhaustion or nerve poisoning, following infectious disease, absolute rest, mild general massage, strychnine, camphor, ether, and artificial warmth are indicated.

Spurious Angina Pectoris

Hysterical angina is a common ailment in neurotic girls and women. They complain of a sensation of deadness and stiffness and have pains in the back and neck.

Treatment.—The attack is best cut short by loosening constricting clothes and administering ammonia by the nose and the ethereal tincture of valerian (gtt. xx) internally in water. Judicious management of an underlying neurasthenic condition will improve and cure the patient.

Angina Pectoris

This form of circulatory disturbance is supposed to be due to imperfect cardiac nutrition and changes in the coronary arteries, and gives a grave *prognosis*. The pain of true angina is agonizing and extends into the neck and arms, with great fear of death. It occurs mostly in adults in connection with other clinical evidence of disease in the heart or vessels. The face is ashy, the patient has a cold sweat, the pulse may be regular or irregular, and the pain may last up to a minute or two. The patient is exhausted for some time after the attack. Attacks may recur at long or short intervals and may end in death.

A *mild true angina* is noticed in valvular disease. There is a sensation of deadness and stiffness—cold and pain in the back and neck. As a rule there is no pain in heart disease; angina makes the exception. The patient is afraid to move or breathe. At the end of the paroxysm there is flatulence, with eructations and a desire to urinate. True angina appears to have no connection with defects of the mitral valve and is more symptomatic of fatty muscular degeneration, heart syphilis, and arteriosclerosis. The state of the heart during a paroxysm is not known. The pain comes on during exertion.

Differential Points.—We must distinguish angina pectoris from the pain of aortic aneurysm, pericarditis, and pleurisy, and from pain over the heart in a hyperæsthetic area and pain in the intercostal muscles.

Treatment.—A person subject to attacks of angina pectoris must lead a quiet life, avoiding excitement and overexertion, and should always sleep in a cool room. A dose of laxative medicine should be taken once a week at least, and five drops of hydrochloric acid may be taken after eating. In the way of diet the patient should avoid beans, pork, rich dressings, dense cheese, pastry, and fried sea food. In the attack the patient may have internally from 10 to 20 drops of Hoffmann's anodyne or compound tincture of valerian or 5 to 10 drops of chloroform on cracked ice. A hypodermic injection of morphine, $\frac{1}{4}$ of a grain, with atropine, $\frac{1}{150}$ of a grain, may be indicated. Inhalations of amyl nitrite, gtt. 2 to 5, or sulphide of ethyl, gtt. 20 to 30, often give relief.

If the heart is weak after an attack, the patient must rest in bed and also rest after eating.

Should syphilis, malaria, anæmia, gout, etc., be suspected as the underlying cause, the proper management must be inaugurated. General massage is helpful in all circulatory disturbances, and bromide of potassium subdues nervous irritability.

DISEASES OF THE ARTERIES AND VEINS

ARTERIOSCLEROSIS; PHLEBITIS; VARICOSE VEINS; ANEURYSM

GENERAL REMARKS

Auscultatory phenomena in blood vessels are unsatisfactory. When arterial pressure from any cause whatsoever is permanently increased, there is danger of rupture of capillaries with its direct sequelæ, particularly in arteriosclerosis. Arteriosclerosis affecting the coronary artery is a serious damage as regards the nourishment and work of the heart itself. We may have acute *arteriospasm*, as in strychnine, lead poisoning and malaria and acute *dilatation of vessels*, as in shock, in which the body bleeds into its own vessels. Vasomotor paralysis from alcohol, chloral, and infusion of digitalis is often confounded with heart collapse.

The venous circulation may be influenced by the force of the heart's action, or by any obstruction to the circulation, disturbance of lung function, pressure of exudates and tumors, pericardial exudates, and pressure on the inferior and superior vena cava, leading eventually to death.

The pulse varies in various individuals and may be normal anywhere from 50 to 100. Children have a rapid pulse on examination and their pulse is frequently irregular even in sleep.

ARTERIOSCLEROSIS (ATHEROMA)

This is a chronic inflammatory or degenerative process in the intima, resulting in rigidity of the blood vessels. It naturally accompanies old age, and hence the saying: A man is as old as his arteries, or in other words he may be old at forty. It is often hereditary and has rheumatism, gout, syphilis, lead poisoning, alcoholism, malaria, chronic intestinal putrefaction, or high living as an underlying cause, and is frequently associated with heart and kidney disease. It is diffuse or localized in any organ or tissue. It is the underlying cause of organic nutritional changes in organs. Bright's disease, organic heart disease, hepatic disease, aneurysm, hæmorrhage, and apoplexy often have their origin in vascular degeneration.

Symptoms of Pronounced Cases.—A hard, high tension pulse, hypertrophy of the heart, dyspnœa, capillary hæmorrhage in the brain with transient aphasia, hemiplegia, thrombi, gangrene, and insomnia. Arterioscleroris is not common before the age of forty, and is very rare in children.

Treatment.—In the early stage the patient must be told his condition with a view of securing his cooperation in changing faulty habits. Medication is not beneficial in the early stages unless syphilis or malaria is present. The skin and bowels must be kept active. As a rule, alcohol is prohibited, and a change from city to country life, and vice versa, is beneficial. Mild massage and daily exercise are beneficial. Good water may be taken ad libitum.

Diet.—There should be about five hours between meals. The meals should be dry; liquids may be taken between meals.

Specimen diet: Cereals, fish, meats sparingly, ham, eggs, tongue, toast, crackers, salads, onions, milk, coffee, tea, ginger ale, Vichy, hot water, cocoa, and one ounce of whiskey a day. Large meat consumers may adopt a vegetarian diet for a time with benefit to themselves. (See Nutrition.)

Medication.—When syphilis or malaria is suspected as an underlying condition, potassium iodide or Warburg's tincture may be given for a time, or calomel (gr. j) three times a day for three days, and occasionally repeated. For dyspnœa, venesection, nitrite of amyl, tincture of aconite (gtt. ij to x), belladonna or atropine, or morphine (gr. ¼ subcutaneously) is *to* be employed.

In *Insomnia with Dyspnœa,* we may try in addition cannabis indica, gr. $\frac{1}{2}$ at bedtime; hyoscine, gr. $\frac{1}{100}$ at bedtime; or nitroglycerin, gr. $\frac{1}{100}$ to $\frac{1}{50}$ three times a day.

℞ Codein., ... gr. j;
Urethan., ... gr. xxx.
M. Sig.: Take at bedtime.

When the urine is scanty we administer diuretin, gr. xv five times a day, and other diuretics. (See also Senile Heart.)

PHLEBITIS (INFLAMMATION OF VEINS)

This may be simple or septic and spreading. The simple variety may terminate in resolution or turn into an abscess.

Symptoms.—The superficial veins are hard and tender to the touch (thrombosis) and surrounded by red inflamed tissue or by collateral œdema. Gout and syphilis are frequently underlying causes; injury and undue pressure are exciting causes.

Treatment.—Rest, elevation of the limb, cold lead lotion applied by compress, an ice bag to the inflamed region, free catharsis, and light diet. If suppuration is evident, a free incision is indicated.

Venous thrombosis (marastic) is observed in all forms of cachexia as a complication.

The *septic, or spreading, variety of phlebitis is* a dangerous malady according to its location. Thus, in sinus phlebitis following otitis media or mastoid operations or in septic phlebitis of the pelvis following childbirth the prognosis is grave. Phlebitis of this nature may terminate in fatal embolic pyæmia. The *treatment* is symptomatic and surgical.

VARICOSE VEINS

Varicose veins are common in the rectum (hæmorrhoids), the scrotum (varicocele), and the lower extremities. The varicose condition is due to increased venous pressure and changes in the walls of the vessel. Hæmorrhoids and hæmatocele of the scrotum will be discussed elsewhere.

Varicosities in the lower extremities produce fatigue, cramp, swelling, pain, and numbness in the affected limb. Occasionally a vein ruptures and a brisk hæmorrhage follows, which is readily controlled by compression. *Venous thrombosis* may set in and the whole leg become œdematous and inflamed. Venous thrombosis is a frequent complication in cachexia from any cause.

Treatment.—For simple varicosities we order a daily morning dose of salts in warm water, and advise the patient to wear an elastic stocking or apply a rubber bandage three inches wide and five yards long from the toes up, *over* a thin long stocking with the toe end cut away. If inflammation sets in, and the vein becomes hard and painful, the limb must be elevated and cold lead water applied for a day or two. In very obstinate cases a radical cure by ligation and incision or excision may be attempted.

ANEURYSM

An aneurysm is a blood tumor having for its walls a dilated artery or communicating with an artery. It is formed by the yielding of one or more of the coats of a blood vessel in consequence of injury or strain or from tissue degeneration, as we find it in alcoholic or syphilitic individuals or in those suffering from arteriosclerosis to such an extent that the artery does not stand blood pressure. Embolism of a blood vessel with subsequent inflammatory changes and weakening of the arterial wall beyond the embolus is another cause of aneurysm.

The exact structure of an aneurysm cannot be made out by an external examination. The form and size can be approximately determined by palpation and percussion, etc. We speak of a fusiform, sacculated, and dissecting aneurysm.

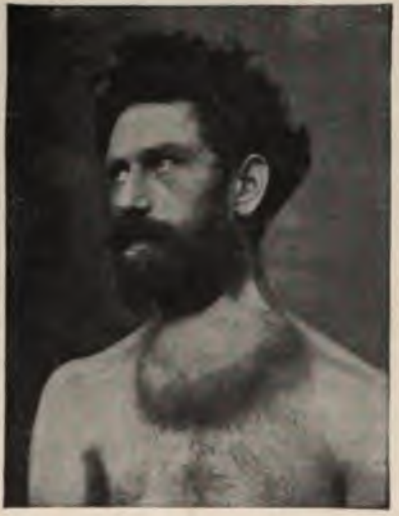

FIG. 119.—AORTIC ANEURYSM.

Symptoms.—Pain and pulsating and expansile swelling. The pulse is delayed and diminished in force on the diseased side. A murmur may or may not exist.

Pressure effects are erosion of bone, enlargement of superficial veins, local œdema, nerve paralysis, husky voice and aphonia from pressure paralysis on recurrent nerve, and dysphagia and dyspnœa from obstruction of the œsophagus and trachea, according to location.

An aneurysm may rupture suddenly or leak into the surrounding tissue or undergo spontaneous cure, in which event there is usually a decrease of pulsation and of the size of the swelling.

Differential Diagnosis.—In an abscess or tumor over an artery the pulsation is not expansile and the swelling is not influenced on compressing the artery above. A carotid aneurysm may be distinguished from an enlarged thyreoid gland by the gland moving with the larynx in swallowing. When the physical signs are not conclusive, an exploratory needle puncture may be made.

Aneurysm of the Aortic Arch

The accompanying picture shows the external appearance of this lesion in a patient who was under the writer's observation for three years. The aneurysm was discovered before it became visible. Dulness under the sternum with a bruit above the heart dulness was evident, and it progressed to rupture.

The rational signs of Aortic Aneurysm are: Pain, steady or in paroxysms, reflected to neck or arm, dry cough, dyspnœa, noisy respiration, hoarseness, *aphonia, dysphagia,* difference in pupil, dilatation of surface veins or œdema of head and arm, an impressible fluctuating expansile tumor, dull on percussion with or without systolic thrill or murmur, or double murmur.

Percussion is negative excepting in aneurysm near enough to the chest wall to give dulness. There is usually a difference in the radial pulse. In aneurysm of the descending portion of the arch, pressure is exerted against the dorsal vertebræ, causing erosion and great pain, and a tumor may appear posteriorly.

In discriminating aneurysm from mediastinal tumor, pulsating empyema, aortic insufficiency, neurotic pulsation of aorta, displaced heart, a careful clinical history and examination will establish the diagnosis by exclusion. Aneurysm of the aorta may develop and expand posteriorly between the roots of the lungs and compress a bronchus to such an extent that the lung becomes atelectatic and dull on percussion and hides the thrill and murmur of the aneurysm.

Aneurysm of the Abdominal Aorta

The **rational signs** are pain, vomiting, epigastric pulsations, a tumor which pulsates occasionally, and a disturbed rhythm of the femoral pulse. A bruit may be present or absent. The aortic pulsation in hysterical women must not be mistaken for aneurysm. In a psoas or lumbar abscess there is no thrill and no bruit.

The **prognosis** is not so serious as in aneurysm of the aortic arch.

Aneurysm of the Splenic Artery.—This gives symptoms akin to those of gastric ulcer—pain and hæmatemesis. The diagnosis is very difficult unless it were possible to recognize a pulsating tumor in the left hypogastrium by physical signs or by means of the fluoroscope.

Arteriovenous Aneurysm presents no special clinical phenomena.

Treatment of Aneurysm.—The treatment of an accessible or external aneurysm is surgical, by ligature or excision or both. If pressure can be applied between the aneurysm and the heart it may be tried before operating.

The symptomatic management comprises digital pressure, a tourniquet, a bag of shot, rest in bed, cold to the sternum, iodide of potassium and arsenic internally, subcutaneous injections of gelatin (40 injections of ʒj each), galvanopuncture, repeated venesection, and occasional morphine injections to quiet pain.

LYMPHATIC SYSTEM

LYMPH STASIS; LYMPHANGEITIS; ACUTE AND CHRONIC LYMPHADENITIS

GENERAL REMARKS

Lymph is a transudate of the blood through the capillaries. It gets to the parenchymal cells laden with nutrient material and eventually carries away certain products of combustion which it returns to the circulation.

The composition and quantity of lymph must be different in different parts of the body and in accordance with the needs of the part. Difficulties in the transit of lymph through the capillaries, if they exist, are not recognized clinically. The clinical interest centres in the accumulation of lymph in spaces and cavities. The pressure in the lymph system is dependent upon arterial pressure and is modified by the counterpressure offered by the various tissues.

Lymph Stasis.—Lymph canals may become obliterated or dilated (*lymphangeiectasis*) or become inflamed (*lymphangeitis*). When the superficial lymphatics are blocked, the skin is covered with blebs or vesicles. We see this condition occasionally on the scrotum or vulva. Dilated lymphatics may present as distinct tumors (lymphangeiomas). The massive tongue of cretins (macroglossia) is an illustration of the hypertrophic condition of tissue from lymph stasis.

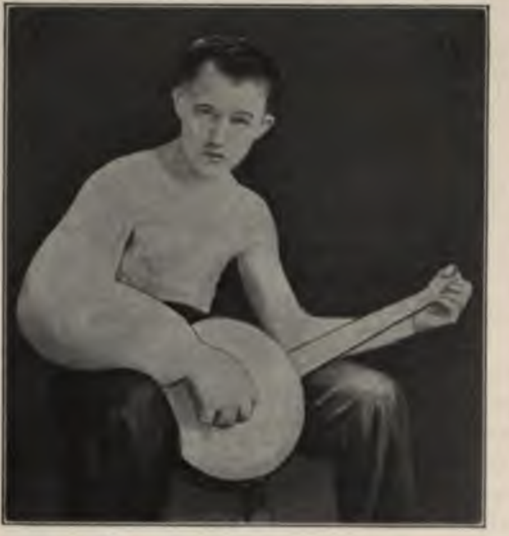

FIG. 120.—UNIQUE CASE OF CHRONIC LYMPH STASIS.

A most remarkable case of lymph stasis has been under the writer's observation for many years. The young man, now twenty-four years old, and whose picture is here produced, was born with the deformity. His mother is in good health; the father died at the age of fifty-six, of diabetes. Five other children are normally developed. The young man is able to use his enormous right arm for all purposes, and is a fair performer on the banjo and guitar. The arm is one dense, hard tissue with several sacs of spongy tissue in the dependent parts. On scarifying this spongy skin, the lymph comes out in heavy drops, and a pint can be gathered in the space of an hour. The young man is afflicted with epileptic seizures, but complains very little about his arm.

LYMPHANGEITIS AND LYMPHADENITIS

Inflammation of the lymph vessels is associated with swelling or inflammation of the lymph nodes, and is due to infection. Lymph nodes hold up the infecting material and become swollen and inflamed themselves, such infection terminating in resolution or pus formation. Occasionally septic products appear to pass or escape the glands, and general sepsis or blood poisoning ensues.

Symptoms.—Red lines run from the wound to the nearest lymphatic glands. The parts are painful and tender. The patient may have in addition chills, fever, vomiting, and diarrhœa.

Treatment.—Moist antiseptic dressing to the portal of infection, with elevation and rest of the affected part, a cold lead lotion or hot fomentations to the inflamed parts, and the free use of the knife to allow of the escape of *pus or seropus,* should it form.

Acute Lymphadenitis is treated by applying cold (ice bag) or heat, by the hot water bag or a poultice. Incision or excision may become necessary. The glands in the neck, axilla, and groin are the principal glands to suffer infection. An acutely inflamed gland may be ready for the knife in a short time. On the other hand, there are cases of subacute intensity with circumglandular induration and swelling and semifluctuation which require surgical interference before abscess formation. If for any reason whatsoever it is not desirable to enucleate such glands, a free incision extending through the capsule of the gland may be made and the latter broken up by manipulating with a blunt dressing forceps or by scraping with a sharp spoon, after' which the wound must be kept open under a moist bichloride or iodoform dressing. Such manipulations are painful and should be done under anæsthesia. A superficial and accessible glandular abscess may be cut open without anæsthesia, provided the patient will hold or can be held still.

Chronic Lymphadenitis.—The following diagram will aid us in our conception of the term lymphoma:

- LYMPHOMA
  - Inflammations
    - Acute Lymphadenitis.
    - Chronic Lymphadenitis
      - Simple Hyperplastic Lymphoma.
      - Tuberculous Lymphoma.
      - Syphilitic Lymphoma.
  - Tumors......
    - Malignant Lymphoma.
    - Lymphosarcoma.
    - Secondary Malignant Tumors
      - Carcinoma.
      - Sarcoma.

In chronic lymphadenitis we discriminate between the simple, tuberculous, and syphilitic varieties.

In *simple hyperplastic lymphoma*, an affection which is found mostly in children in the first decennium of their lives as the result of a chronic peripheral irritation, such as eczema, nasal or pharyngeal catarrh, hypertrophied tonsils, carious teeth, etc., the glands are comparatively small, painless, and movable, and they show no tendency to break down and discharge their contents and form scars.

The glands most frequently affected are the cervical, axillary, peribronchial and periœsophageal (mediastinal), mesenteric, and inguinal. Whenever we meet with enlarged lymph nodes we should endeavor to seek the cause or portal of entrance of the infecting and irritating agent. Occasionally the primary focus has cleared up, but the gland remains enlarged, and in some cases glandular enlargement accompanies anæmia and malnutrition without any appreciable local source of irritation. Cervical and mediastinal lymph nodes are readily infected from the buccal cavity, the nasopharynx, the bronchi and œsophagus; the mesenteric and inguinal glands are infected from the intestine and genitourinary tract.

TUBERCULOUS LYMPHOMATA.—The glands vary in size from that of a pea to that of an egg. Tuberculous lymphomata are most frequent in the second and third decennia. Another point quite characteristic of tuberculous lymphomata is the presence of packages consisting of a number of glands of different size connected together. Tuberculous glands may be freely movable or more or less fixed. In one case the tuberculous process is entirely intraglandular and in the other case it has extended to or beyond the capsule, causing this latter to react by inflammation with the production of thickening of the capsule and its attachment to the surrounding parts. In the one case you have the tuberculous process without periadenitis, in the second case with periadenitis. The presence of scars shows that the tuberculous process has gone even one step further, viz., to the formation of abscesses. When a tuberculous abscess, after its formation within a lymph node, comes to the surface, it does so by perforating the thickened capsule through a small fistulous opening and by emptying itself into the subcutaneous connective tissue, lifting up the skin and forming a subcutaneous abscess. Afterward the skin breaks at some point, fistulæ with fungous granulations result, which take a long time to close. From the complicated shape of the abscess cavity—partly intraglandular, partly subcutaneous—and the long duration of the discharge it can readily be understood why the tuberculous scars always have a characteristic irregular shape, never linear and smooth, usually drawn out in radiating lines, showing retractions here and prominences there, and becoming adherent to the underlying parts.

Syphilitic lymphomata occur in all three stages of syphilis. In the first stage we find large, painful glands in the submaxillary or submental region, with a history of recent origin, and we find the initial lesion on the lips, tongue, tonsil, or other part of the mucous membrane. In the secondary stage we find small nodes, not larger than a bean, in almost all parts of the body where glands are found; they are painless, freely movable, and never break down. Gummata of the glands, found in the third stage of the disease, are rather rare. They grow slowly, are painless, have a firm, elastic consistency, and average about the size of a walnut. At first they are not adherent; later, as the gumma breaks down, it becomes adherent to the skin, breaks through and forms the characteristic syphilitic ulceration.

As for *malignant lymphomata*, they are, in an early stage, often indistinguishable from tuberculous glands, appearing, as they usually do, at first on one side of the neck as numerous nodes of moderate size, about that of a bean, but without any peripheral lesion being found. Later on, however, they increase steadily in size and number, some of them growing to the size of an apple, displacing and compressing the neighboring organs. They never break down, never invade the capsule, and never form adhesions with the surrounding parts. Death results from increasing weakness or from pressure upon important organs.

Lymphosarcoma occurs as a single tumor always, which rapidly grows and invades the neighboring parts, becoming fixed.

Of secondary malignant tumors it will suffice to say that they follow in the course of primary malignant tumors, are at first freely movable, and later become attached to the surrounding parts.

Treatment.—Acute lymphadenitis without abscess and simple hyperplastic lymphoma require treatment only of the original site of infection; syphilitic glands never require surgical treatment, except some cases of broken down gummata; malignant lymphomata turn out fatal, even where the most painstaking attempts at thorough removal are made;

lymphosarcomata are capable of removal only in the earliest stage of their development. Secondary malignant tumors of course should be removed if possible, but that is usually done when the operation for the primary carcinoma is performed. Tuberculous lymphomata, however, very frequently require surgical treatment. By no means should all cases of tuberculous lymphomata be operated upon. A great many patients may get well without operation, especially children, by placing them in the best possible surroundings, giving them good nourishing food and tonic treatment. We may even say that there is no stage of the disease in which a spontaneous cure is impossible. This favorable outcome is of course most likely to occur in the earliest stages of the disease, in those cases where the glands show only a hyperplasia, with perhaps a few tubercles scattered through their substance. But even cheesy foci may become encapsulated, abscesses may discharge until all the necrotic portions of the gland have been thrown out, and the process thus terminates in a cure. If, in spite of prolonged general treatment, the glands continue to increase in size, or if they break down and form abscesses or fistulæ, the indication for surgical treatment is given. For cosmetic reasons a method of conservative surgical treatment has been devised to obviate making incisions by injecting certain substances into the tuberculous lymphomata or abscesses. For this purpose a 5 to 10 per cent emulsion of iodoform in glycerin or oil is commonly used. Chloride of zinc and other chemicals have also been employed. These methods are to be recommended only in cases where there is but a single tuberculous lymph node or abscess. The preferable treatment is either by incision and scraping out or extirpation, the former in cases of abscess with fistula, the latter for more or less solid glands. In the submental region the incision is usually made from the chin to the hyoid bone; in the submaxillary region, parallel with the horizontal ramus of the lower jaw; in the supraclavicular region, by an incision parallel to the clavicle; in the sternomastoid region, where the glands are found most frequently, by incisions in front of and behind the sternomastoid muscle. These incisions will usually give sufficient room, but if necessary the muscle should be divided transversely, in order to give more room, and be reunited at the end of the operation. The wound is then sewed up and a drain inserted at the bottom. In cases without periadenitis the operation is quite simple, the difficulty increasing in direct proportion to the amount of periadenitis and requiring in many cases very delicate dissection to free the glands from the important structures of the neck.

CHAPTER XIII

THE CIRCULATORY SYSTEM—*Continued*

CONDITIONS OF THE BLOOD

SYNOPSIS: Terminology and Definition of Blood Conditions and Remarks on Leucocytosis.—Anæmia from Hæmorrhage.—Chlorosis.—Pernicious Anæmia.—Secondary Anæmias.—Pseudoleucæmia.—Leucæmia.—Splenic Anæmia.—Purpura and the Hæmorrhagic Diathesis.—Hæmophilia.—Remarks on Hæmorrhage.—Septicæmia and Pyæmia.

GENERAL REMARKS

MODERN medicine is concerning itself more and more with hæmatopathology. From a clinical standpoint, the blood may be looked upon as a tissue liable to become infected and to carry infection to all other tissues, and any organ of the body may become diseased through the blood. On the other hand, pathological changes in one or more of the various organs produce pathological changes in the blood. When blood changes occur without demonstrable lesions of organs, we speak of *blood disease* or blood conditions.

Terminology and Definition

Normally, **the red blood cells,** or *erythrocytes,* vary very little in size. Abnormally, they are classed according to size:

1. *Microcytes* are cells smaller than normal. 2. *Megalocytes* are cells larger than normal. According to shape, we have: 3. *Poikilocytes,* irregularly shaped. According to the presence of a nucleus: 4. *Normoblasts,* normal sized nucleated red blood cells. 5. *Megaloblasts,* nucleated red blood cells larger than normal. 6. *Gigantoblasts,* nucleated red blood cells considerably larger than normal.

When red blood corpuscles are *destroyed* in the blood, the iron in the liver increases. (This is not the case in acute hæmorrhage.) In a change from the sea level to an altitude the red blood corpuscles increase in number, and vice versa. Under normal conditions, there are about 5,000,000 red blood cells to the cubic millimetre of blood. The bulk of the red blood cell is composed of hæmoglobin, an albuminous body, rich in an iron pigment. This body is of extreme importance, as it carries oxygen from the lungs to the tissues where it is required.

When hæmoglobin leaves the red blood corpuscles and enters the blood plasma, its energy as an oxidizer ceases. In this instance it is transformed into bile pigment in the liver or under pathological conditions it may leave the body with the urine (hæmoglobinuria). The dissociation of hæmoglobin from the corpuscle is observed in systemic poisoning and in transfusion of blood from one animal species to another. When the hæmoglobin in the general circulation is diminished, the individual shows a peculiar pallor, and we then speak of *anæmia*. Some individuals have naturally a pale complexion without being anæmic.

The Leucocytes.—In classifying the white blood cells, the terms *neutrophile, basophile,* and *acidophile* are used to indicate the chemical selective properties of the cell granules and nuclei.

Leucocytes are classed as follows:

Normal blood contains:

1. *Lymphocytes* are slightly larger or smaller than red blood cells. They contain a single nucleus which stains very deeply and occupies the greater part of the cell.

2. *Large uninuclear leucocytes* may be only slightly larger than the lymphocytes, but many of them are the largest cells seen in the normal blood. The nucleus is vesicular, rather than reticulated, as it is in the lymphocytes, and does not stain quite so deeply.

3. *Multinuclear leucocytes*, the most numerous variety, are two or three times as large as a red blood cell. The nuclei are elongated, constricted, or composed of two or more lobes, usually connected by a thread of chromatin or completely separated from one another.

4. *Eosinophile leucocytes* vary in size from that of a lymphocyte to that of a multinuclear leucocyte and contain in the cell protoplasm strongly acidophile granules. Their nuclei resemble those of the multinuclear leucocytes.

THE PATHOLOGICAL LEUCOCYTES.—I. *Myelocytes* are uninuclear cells the protoplasm of which has neutrophile or eosinophile granules.

1. *Ehrlich's myelocytes* are medium-sized cells with pale, usually central, nuclei and neutrophile granules.

2. *Cornil's myelocytes* are large cells, much larger than a multinuclear leucocyte, with a pale eccentric nucleus and neutrophile granules.

3. *Eosinophile myelocytes* may resemble the eosinophile cells of normal blood, except that their nuclei are single.

II. *Mast cells* are uninuclear or multinuclear cells of different sizes, the characteristic feature of which is the presence of large and small basophile granules.

General Conditions.—*Blood plates* have been much discussed, but little is known about them. They are very small, round or ovoid, colorless, homogeneous or granular bodies of about ¼ or ⅛ the size of a red blood cell, usually showing no nuclear portion and staining faintly by both acid and basic dyes. They are found in both normal and pathological blood. Well nourished individuals have about 8,000 white cells in a cubic millimetre of blood; children have about 9,000.

The *blood plasma* contains from 0.1 per cent to 0.4 per cent of *fibrin*. An increase of fibrin, *hyperinosis*, 1.0 to 1.3 per cent, is found in *pneumonia, pleurisy,* and *articular rheumatism*. A decrease of fibrin, *hypinosis*, is found in *typhoid fever*, *sepsis*, and *pyogenic diseases*.

The *serum* is the plasma without the fibrin. The recent work with antitoxines shows that its study in health and disease has a great future.

Plethora is a term used to indicate an abnormal fulness of the blood vessels due to an increase of the quantity of blood in the body. The amount of blood in the blood vessels is normally influenced by many conditions, such as the constitution and muscular development, sex, period of life, digestion, etc.

Plethora serosa, or hydræmia, is a diminution of the albumin contained in the plasma. It has been demonstrated in many of the infectious diseases. It is also found in *inanition, anæmia, malignant tumors*, and *cardiac insufficiency.*

Lithæmia is a term used to indicate that condition, gouty or otherwise, in which there is an increase of *uric acid* or *urates* in the blood.

Uræmia indicates the phenomena caused by the retention of certain excrementitious substances in the blood which are normally eliminated by the kidneys. The nature of these poisonous substances is not fully understood, but it is supposed that they are autotoxic.

Lipæmia, or the presence of free *fat* in the blood, is found both in health and in disease. Its real pathological significance is doubtful.

Lipacidæmia.—*Fatty acids* have been found in the blood by von Jaksch in *diabetic coma, leucæmia, acute yellow atrophy* of the *liver*, and in the *acute infectious diseases.*

Acetonæmia.—*Acetone* has been isolated from the blood in many pathological processes, particularly in fevers.

Cholæmia is a name given to those grave symptoms of poisoning which are due to the presence of *bile* and *bile acids* in the blood.

Hæmoglobinæmia is applied to the condition in which *hæmoglobin* is in solution in the blood, due to a lessened resistance on the part of the red blood cells. It is found after *extensive burns, acute poisonings, infectious* or otherwise, and after *transfusion of blood* from one animal species to another.

Pyæmia is the name given to that condition in which *pyogenic bacteria* are present in the blood and there is a tendency to the formation of pus *foci* and *abscesses* in different parts of the body.

Septicæmia also indicates the presence of *bacteria* and their *poisons* in the blood without a tendency to abscess formation in different parts of the body.

Toxæmia is used to designate the presence of some *poisonous principle* in the blood.

Oligocythæmia is a condition of the blood usual soon after a hæmorrhage, in which there are *fewer red blood cells* than normal.

Polycythæmia, an increase in the number of red blood cells, is usually due to a decrease in the amount of the plasma. It is found in *diarrhœa, dysentery, cholera*, or any disease attended with excessive watery exudates and in conditions, such as *endocarditis, emphysema*, and *asphyxia*, in which there is insufficient aeration of the blood. It is also observed in people at great altitudes. Various drugs, such as *phosphorus, pilocarpine, eserine*, etc., and cold baths may cause it.

Polychromasia is a word used to indicate the property of the red cells in various forms of *anæmia* and in the *normal bone marrow* when they acquire a *diffuse brownish stain.*

Hæmophilia is the name applied to that *hereditary* or *acquired* constitutional anomaly which predisposes the subject to persistent and often fatal *hæmorrhage of* traumatic or spontaneous origin.

LEUCOCYTOSIS

Leucocytosis is a term used to indicate a temporary distinct increase of the number of leucocytes above the normal.

RIEDER'S CLASSIFICATION:

(*a*) *Physiological* leucocytosis.

1. Leucocytosis of *digestion.*
2. Leucocytosis of *pregnancy.*
3. Leucocytosis of the *new-born.*

(*b*) *Pathological leucocytosis* (which seems to be an effort of Nature to overcome infection).

1. *Post hæmorrhagic leucocytosis.*
2. *Cachectic.*
3. *Ante-mortem* (agonal, terminal, leucocytosis of the moribund).
4. Leucocytosis of *acute infections.*

In *inflammatory conditions,* leucocytosis is said to indicate a good prognosis.

Physiological Leucocytosis.—*Digestion.*—After eating it has been observed that in healthy individuals the leucocytes may increase up to 15,000 to 16,000. In a number of gastric disorders in which torpidity of the stomach and bowels exists, they fail to increase. The increase is not a reliable diagnostic test of gastrointestinal disorders, because it is frequently present in other conditions.

Pregnancy.—During the latter months of pregnancy there is usually a leucocytosis, which may be as high as 20,000.

In the *new-born* there may be as many as 20,000 leucocytes. Normally the number gradually diminishes until the child reaches the age of eight or ten years, at which time the number is the same as in adults.

Pathological Leucocytosis.—It is usual to find a leucocytosis following *hæmorrhage.* In general it is in proportion to the extent and rapidity of the loss of blood. It usually disappears or is greatly diminished long before the red cells are restored to their normal numbers (Ewing).

Cachectic leucocytosis is observed in *chronic anæmia, local inflammations,* and *chronic toxæmia.* In *tertiary syphilis, tuberculosis, nephritis, carcinosis,* and rather a smaller proportion of *sarcomata* cachexia is unaccompanied by leucocytosis unless there is a distinct local *inflammation, necrosis,* or *hæmorrhage.*

Ante-mortem, or *agonal, leucocytosis* has been found in a great many diseases, but it has not been sufficiently studied to make the examination of the blood of any particular value.

Leucocytosis of Acute Infections.—It is in this connection that the study of the number of the leucocytes is of value in diagnosis, prognosis, and treatment, although much more work needs to be done. Such a leucocytosis is found in *pneumonia, diphtheria, scarlatina,* and all *purulent exudative inflammations.* It is absent in the following diseases when they are unaccompanied by local inflammatory conditions: *Typhoid fever, measles, tuberculous conditions,* and *acute malarial seizures.*

In *pneumonia* there is an initial *hypoleucocytosis* succeeded by a marked *hyperleucocytosis* which continues throughout the disease and is unaffected by pseudocrises. The more severe and extensive the pneumonia the greater the leucocytosis. Sometimes the initial hypoleucocytosis remains, indicating a very bad prognosis. Counting of the leucocytes may be of great value in distinguishing between *pneumonia* and *typhoid fever* or *malarial disease*.

In *diphtheria*, the counts are about the same as in *pneumonia*, but are of no value in prognosis.

In *typhoid fever*, there is *no* leucocytosis unless inflammatory complications exist. It is usual to have a *lymphocytosis*. Counting of the leucocytes thus aids in the distinction between *appendicitis* and *typhoid fever*.

In *tuberculous* conditions, a leucocytosis may indicate a secondary infection, such as an *empyema*, a *cavity* with *suppurating walls*, or a *hæmorrhage* or *cachexia*.

Generally speaking we may say that a single observation as regards leucocytosis is of little value. Even where we make successive observations, and there has been progressive increase in the number of leucocytes, if the percentage of polynuclears does not go up, it really means nothing.

Eosinophilia.—The increase in the number of eosinophiles found in various pathological conditions has not as yet offered much definite aid in diagnosis and prognosis. Of late, several investigators have observed a remarkable increase of these cells, even to 68 per cent, in the acute stage of *trichiniasis*. The increase seems so constant in this disease as to make it advisable to count the eosinophiles in all febrile conditions of doubtful origin, and especially in those cases in which indefinite intestinal and muscular symptoms exist.

Lymphocytosis.—Lymphocytosis is often of considerable importance. It has been found to exist in the so called lymphatic constitution, in *idiopathic epilepsy*, in *Basedow's disease*, in *rhachitis*, in *typhoid fever*, in *diphtheria*, in *bronchopneumonia*, in *pertussis*, *during measles*, at the close of *scarlet fever* and *smallpox*, during prolonged *lysis* in *pneumonia*, in the less acute *diarrhœas* of infancy, in chronic diseases involving *lymphatic tissues*, etc.

ANÆMIA

Simple Anæmia from Hæmorrhage

If the patient survives the loss of blood, from whatever part of the body it may occur, regeneration goes on with great rapidity. The watery and saline elements are absorbed rapidly from the digestive tract and the albuminous elements are quickly renewed. The corpuscles are increased in number more slowly, weeks or months being required for them to reach the normal number. The hæmoglobin is the last to reestablish its normal percentage.

The **symptoms** are those of anæmia, secondary to other causes described under Secondary Anæmia. Great dyspnœa, "air hunger," one of the most distressing sights the physician can witness, may follow severe hæmorrhage.

The **treatment** is to supply fluids by drinking or by giving saline enemata or intravenous injections of normal salt solutions. In addition to this, food and proper hygiene are essential.

Chlorosis

Chlorosis (green sickness) is a special form of primary anæmia mostly seen in young women at or a little beyond puberty. It is almost always associated with incomplete development of the vascular and generative systems. Chlorosis has been attributed to autoinfection from the gastrointestinal tract and also from the ovaries.

Pathology.—The essential characteristic of the blood in chlorosis is *reduction* of the *hæmoglobin*. In ordinary cases the amount averages 40 per cent, and in severe cases may be as low as 20 per cent. The number of red cells is usually reduced, although exceptionally it is normal. They are never reduced in proportion to the hæmoglobin. They are pale in color, and *poikilocytes, microcytes,* and *normoblasts* are seen. The *leucocytes* are slightly increased in number.

Ætiology.—This disease seems to be in some way associated with the evolution of the sexual life in young women, but we know very little as to its real cause. Heredity seems to play a part in some cases. A *chlorotic* history on the maternal side or a *tuberculous* family history has been noted in certain instances. Although it is most frequent among the *poor* and *overworked* factory girls who live amid *unhygienic surroundings* upon *insufficient* or *improper food,* it is not uncommon among young women of the higher classes. A *blood poisoning* from the absorption of toxic principles elaborated in the constipated bowel has been mentioned as a cause, and Virchow suggests a lack of development of the arterial system.

Symptoms.—The symptoms are those of secondary anæmia, especially the nervous and dyspeptic symptoms. The color of the skin, instead of being simply pale, as in anæmia, is greenish yellow, which is characteristic, giving the disease its name of "green sickness." The gastrointestinal symptoms, nausea, vomiting, epigastric pain, and constipation are prominent. Occasionally vomiting of blood renders the distinction from gastric ulcer very difficult, as ulcer of the stomach may exist in chlorotic women.

A decrease of the gastric juice with hyperacidity is frequent. The *appetite* is capricious and often perverted, acid foods being longed for. Gastroptosis is sometimes found in chlorotic girls. Emaciation is very unusual. *Œdema* of the ankles and puffiness of the face, arousing the suspicion of nephritis, may be noticed. *Irregular* fever sometimes exists. *Dyspnœa, amenorrhœa,* mental depression, irregular nervous symptoms, languor, and *lassitude* are usual.

Diagnosis.—The diagnosis is usually based upon the age, the sex, the amount of hæmoglobin, and the rapid improvement from the use of iron combined with mild laxatives.

It is distinguished from nephritis by analysis of the urine and from severe anæmia by a blood examination.

Prognosis.—The prognosis is favorable, provided sufficient iron is administered and the patient is able to assimilate it. Relapses, however, are frequent and prolong the course of the disease.

Treatment.—*Iron* is a specific, and if it is given and is properly assimilated, the amount of hæmoglobin increases from 5 to 10 per cent each week. It is best to continue its use until the hæmoglobin is above 90 per cent. The *carbonate of iron,* or Blaud's pills, seem to be the best preparations.

The *tartrate of iron* and *potassium*, the *pyrophosphate of iron*, and *liquor peptomangan* are also good forms of iron in this disease.

Fresh air, improved hygiene, sufficient, good, nourishing *food*, and the *prevention* of *constipation* are important adjuvants to the medical treatment. Moderate exercise is indicated, and inhalations of *ozone* are also beneficial in the management of chlorosis and other forms of anæmia.

THE BALLOON TREATMENT OF ANÆMIA.—Dr. Naugier, of Paris, has found that a balloon voyage in the upper air strata for an hour or two results in a very notable increase in the number of red blood corpuscles, which increase persists for a quite considerable time. There is, so far as we can see, nothing antecedently improbable in this assertion, and it seems likely that balloon ascents may, in the not distant future, prove of the utmost service in cases of severe anæmia. Should this prove to be the case, the provision of "hospital balloons," as suggested by Dr. Naugier, may prove an efficient and little expensive means of providing a literal "change of air" for those unfortunate denizens of cities who are unable to compass such a desirable result in any of the more usual ways.

Progressive Pernicious Anæmia

Essential anæmia and *idiopathic anæmia* are *synonyms*. It is a progressive disease of unknown origin, with lesions found in the blood, liver, and bone marrow.

Occurrence.—The disease is widely distributed, and usually occurs in adult life. Children are rarely affected. The progressive anæmia associated with *pregnancy, atrophy* of the *stomach*, and certain intestinal *parasites*, especially the *Bothriocephalus latus* and the *Ankylostomum duodenale*, are not included under this disease.

Pathology.—The blood is pale and diminished in quantity. The red blood cells may be diminished to 1,000,000 or even to 500,000 or 200,000 in a cubic millimetre. The hæmoglobin is proportionally reduced, reaching 30 per cent and lower. A characteristic feature of pernicious anæmia is that the remaining red blood cells contain the normal or even a larger amount of hæmoglobin than normal. *Microcytes, megalocytes, normoblasts, megaloblasts*, and *poikilocytes* are found. The leucocytes are normal in number, or they may be reduced.

The *liver* may be enlarged and fatty. *Iron* is present in this organ to an abnormal amount, a condition possibly peculiar to pernicious anæmia (Hunter). The *spleen* and *kidneys* also show an increase in the amount of *iron*. The *bone marrow* is lymphoid in character and contains a large number of nucleated red blood cells, particularly *gigantoblasts*, and it resembles the bone marrow of a child.

Symptoms.—The disease advances slowly and insidiously. The patient cannot fix a time when he first noticed that he was not well. A feeling of languor, soon becoming extreme, associated with a peculiar waxy white or pale lemon pallor, a flabby, fat frame, faintness, and dyspnœa are the principal symptoms. The debility gradually becomes very marked, syncopal attacks become frequent, and capillary pulsation, visible pulsations of the arteries, and hæmic murmurs are detected. The superficial veins may pulsate. The ankles become slightly œdematous. The urine is usually low in specific gravity, is of high color, and contains an excess of urobilin. It may, however, be pale. The gastrointestinal symptoms of anæmia are present. Diarrhœa is not infrequent. An irregular slight rise of temperature is usual, 100° to 101° F., but it may be subnormal or as high as 103° or 104°. The tendency to *hæmorrhages* is seen in purpuric spots in the skin and mucous membranes. Retinal hæmorrhages are common. The *languor, faintness,* and *dyspnœa* increase, the patient falls into a half torpid delirium, and at length expires after an illness of several months.

Prognosis.—The prognosis is usually bad, although patients recover after the use of the *arsenical* treatment. If the red cells fall below 1,000,000, and there is a relatively large number of megaloblasts, particularly gigantoblasts, the prognosis is unfavorable. Fatal cachexias with or without anatomical lesions and associated with gastric anacidity have been reported.

Diagnosis.—According to Ewing, the diagnosis *may* rest upon the presence of numerous *megaloblasts* and *megalocytes* with relatively increased hæmoglobin, 33 per cent of *megalocytes* with relatively *increased hæmoglobin,* or an excess of *megaloblasts* over *normoblasts*—a single *gigantoblast* or *megaloblast* in *pathological mitosis.* The diagnosis cannot be based upon an extreme reduction of red cells. The diagnosis may require the complete summation of all the clinical and morphological data, as well as observations on the course of the disease, or even microscopical examination of the marrow. In making the diagnosis of pernicious anæmia the condition of the blood is not in itself conclusive.

Treatment.—As iron has never been shown to be of benefit in these cases, it is unnecessary to try it. *Arsenic* in increasing doses has cured a few cases and improved many. It is advisable to administer three minims of Fowler's solution three times a day to begin with, increasing to five minims at the end of the first week, ten at the end of the second, fifteen at the end of the third, and, if necessary, up to twenty or thirty, watching for vomiting and diarrhœa, which are the first symptoms of an overdose. Rest in bed, a light, nutritious diet, and oral and intestinal antiseptics are adjuvants, and dilute hydrochloric acid should be given after each meal to aid digestion.

Anæmia Secondary to Other Diseases

This form is due to long continued drain on the albuminous material of the blood. This is found in *Bright's disease, chronic suppuration, prolonged lactation,* and *rapidly growing malignant tumors,* such as *cancer;* or to *inanition* and *defective nutrition, insufficient* or *improper food, digestive disturbances, improper modes of life,* or *intestinal parasites.*

Toxic Anæmia.—The use of certain drugs to a degree of poisoning, such as *lead, mercury, arsenic,* and *salicylic acid,* causes anæmia. *Syphilis, malaria,* and the *infectious diseases, tuberculosis,* and *pyrexia,* which cause an elaboration of *organic poisons,* also cause a secondary anæmia.

Pathology of Secondary Anæmia.—The number of corpuscles, the percentage of hæmoglobin, and the fluid constituents of the blood are all diminished. The red cells usually show a more marked difference in size than normally, and they may be smaller than normal (*microcytes*). A moderate *poikilocytosis* may be present. *Nucleated red blood cells* (*normoblasts*) are always found. They are more abundant in the secondary anæmia caused by a long continued drain upon the albuminous constituents of the blood than from the other causes.

Symptoms.—1. PALLOR.—Pallor of the skin and mucous membranes. The colorless appearance of the conjunctivæ roughly indicates the anæmic condition, but as not all pale people are anæmic, and vice versa, more reliance should be placed upon counting the red cells and upon estimating the amount of hæmoglobin than upon the appearance.

2. HEART SYMPTOMS.—The pulse is rapid and usually of low tension, although it occasionally may be of high tension. *Syncope* and *palpitation* are common. The *heart* may be slightly *dilated*. A *systolic* murmur which is not infrequently transmitted upward may be heard over the pulmonary area. It is not constant and is often more audible when the patient is lying down. A systolic murmur transmitted into the axilla may be heard at the apex, due to a relative insufficiency of the mitral valve arising from poor muscular tone or from slight dilatation of the left ventricle. There is a tendency to *thrombosis*, particularly in the femoral veins.

3. DYSPEPTIC SYMPTOMS.—These are usually present. The appetite is irregular and capricious, the tongue is coated, and the bowels are constipated.

4. LUNG SYMPTOMS.—The dyspnœa upon exertion is in proportion to the degree of the anæmia. A slight cough without expectoration is frequent.

5. CEREBRAL SYMPTOMS.—There are often *spots* before the *eyes*, *tinnitus aurium*, and *vertigo*. *Headaches*, with the pain oftenest in the top of the head, are common. Mental *apathy* and inability to concentrate the mind are regularly present.

6. NERVOUS AND HYSTERICAL SYMPTOMS.—These are almost always marked. There are *irritability* and *restlessness*, *sleeplessness*, *drowsiness* by day, *hot* and *cold flashes*, peculiar *sensations*, and *irregular* pains. *Languor* and *lassitude* are constant.

7. GENERAL SYMPTOMS.—The *temperature* may be irregular and lowered in severe cases. A little *œdema* of the *legs* and *ankles* is often seen. Emaciation is uncommon. If it is present, we suspect tuberculosis or carcinosis. Lack of endurance and bodily weakness are prominent symptoms. In women *menstrual irregularities* are frequent. *Amenorrhœa* is common and should cause no anxiety. The *menses* may be *scanty* and *light colored*. *Menorrhagia* is sometimes seen.

Diagnosis.—In addition to the above mentioned symptoms the diagnosis is made by examining the blood, the features of which are discussed under the heading of the pathology of this disease.

Treatment.—By finding the cause, with accessory factors, such as improper modes of life, digestive errors, constipation, and intoxications, and removing them; by recognizing the value of fresh air, sunlight, and exercise without undue fatigue, we make it possible for the specific drug, *iron*, to act more quickly, thoroughly, and permanently. The usual precautions in giving iron, to avoid headaches and constipation, should be *observed* by choosing the best forms in which to administer it.

In those forms in which there is a continuous drain on the albuminous materials of the blood, it is very difficult to treat the malady so long as the cause of the anæmia remains.

LEUCÆMIA (LEUCOCYTHÆMIA)

This is a disease of the blood characterized by a *continuous increase* in the number of *leucocytes*, which are altered in character, associated with marked diminution of the red blood corpuscles, and changes in the *bone marrow*, *spleen*, and *lymphatic glands*, separately or together.

Ætiology.—Although a great amount of most careful research has been undertaken in the study of this disease, the cause is still obscure. It may occur at any age, although it is most common in middle life. Males are more often affected than females. *Heredity* seems to have some influence upon its ætiology, and *trauma, intestinal intoxication, bad hygiene, syphilis, malaria, rhachitis, latent tuberculosis,* the *constitutio lymphatica, stomatitis,* etc., have been cited as causes. A microbic origin has been suggested, because of the rapidly fatal course of some acute cases, which resembles the course of known infections.

Ordinarily there are seen two main types, although combinations and variations may occur: Splenomedullary leucæmia, or the lienomyelogenous, and lymphatic leucæmia.

Pathology.—1. *Splenomedullary Leucæmia.*—The *spleen* is greatly enlarged, being in a condition of chronic *hyperplasia.* Grayish white circumscribed tumors may occur throughout the parenchyma. There is also an extraordinary hyperplasia of the *red marrow.* The *blood* presents the most characteristic change and will be described under Symptoms.

2. *Lymphatic Leucæmia.*—This is characterized by a general lymphatic enlargement, usually associated with some splenic and bone marrow hyperplasia. The *cervical, axillary, inguinal,* and *mesenteric* glands are enlarged, but they remain movable, soft, and isolated. The *tonsils* may be enlarged. *Peyer's patches* and the *solitary follicles* may be enlarged. The *bone marrow* may be replaced by lymphoid tissue. The *liver* is occasionally enlarged, and the *kidneys* may be enlarged and pale. Increase in size of the *thymus, thyreoid,* and *suprarenal* glands and the *ovaries* is sometimes seen. Leucæmic *tumors* in the various organs, probably developing from foci of leucocytes which have left the capillaries, are rather rare.

Symptoms in General of Both Forms.—The beginning of the disease is insidious, and probably it has existed for some time before any real symptoms attract attention. Usually a progressive *enlargement* of the *abdomen* is first noticed, or there may be *palpitation, shortness* of *breath,* and other general anæmic symptoms. *Indigestion, bleeding* from the *nose,* or severe and even fatal *hæmorrhage* from the *stomach* may be the first symptom.

Splenomedullary Leucæmia.—This form is most often seen, and it is usually characterized by a *gradual enlargement of the spleen,* which may cause pain and be tender upon palpation. This organ may reach an enormous size, extending to the right and downward into the bony pelvis. Occasionally the margin is notched, and from time to time fremitus may be felt over the spleen, resembling that between two layers of roughened pleura. The enlarged spleen may cause pressure symptoms.

Cardiac Symptoms.—The apex beat may be displaced by the heart's being pushed upward by the enlarged spleen. *Hæmorrhages* may occur into the *skin*, the *pleura*, or the *peritoneal cavity*. *Hæmorrhages* from the *nose* are common, but hæmoptysis and hæmaturia are rare. *Hæmatemesis* and *bleeding* from the *gums*, *cerebral hæmorrhages* with *coma*, and *bleeding* into the *retina*, giving rise to retinitis, may be present. A retinitis due to leucæmic new growths has been noticed. Later in the disease *œdema* of the *feet* or general *anasarca* may develop, and at the end *œdema* of the *lungs*. In the respiratory system *shortness* of *breath* is a most marked symptom.

Gastrointestinal symptoms are very common. They are *nausea*, *vomiting*, *diarrhœa*, *dysentery*, *hæmorrhage* from the *intestines*, and, occasionally, *peritonitis* and *ascites*, probably due to leucæmic new growths.

The *nervous system* is not so much affected as in the anæmias. *Vertigo*, *headache*, and attacks of *syncope* are sometimes present.

The *ear* is sometimes affected by hæmorrhages, causing deafness or disturbances in equilibrium. *Leucæmic new growths* may occur in the *tonsils* or *liver*. In males *priapism* may be a very disagreeable symptom. A rise in *temperature* (102° to 103°) is common. The *urine* does not show very much. There may be *albumin*, and the amount of *uric acid* is usually increased.

The *blood* alone offers the distinctive features upon which the diagnosis can be made. In the *anæmias* the red cells show the blood changes. In *leucæmia* it is the *white cells* that we observe for diagnosis. The *leucocytes* are enormously increased in number, often reaching 100,000 and not rarely 500,000 a cubic millimetre. One form of leucocyte not found in normal blood, called, after Ehrlich, the *myelocyte*, may constitute 30 per cent of the white blood cells. These are large, uninuclear, neutrophilic cells which may vary much in size and may have notched nuclei undergoing mitotic or degenerative changes. *Mast cells* are present. The *lymphocytes* are not increased, but may be relatively diminished, as are also the *multinuclear* leucocytes. These also may be undergoing degenerative changes. The *eosinophiles* are increased in proportion, so that there is relatively a great increase. There are also seen, and held by Ewing to be pathognomonic in this disease, *eosinophile myelocytes*.

There is a *reduction* in the *hæmoglobin*, which is often below 50 *per cent*, and the red blood cells are much reduced in number. *Normoblasts* are present in considerable numbers, and *megaloblasts* may be found. Mitotic changes in the nuclei of normoblasts have been observed.

Lymphatic Leucæmia

This is a *rarer* form, more *rapid* and *fatal*, and more common in *young people*. The blood changes are quite different from those of the splenomedullary form. There is not such a great increase in the number of the white blood cells, and the increase is found to take place solely among the *lymphocytes*. *Eosinophiles* and *normoblasts* are rare, while myelocytes are *absent*.

Diagnosis of Leucæmia, Treatment, Etc.

Diagnosis of Leucæmia.—This disease can be diagnosticated only by examining the blood. We must find among the leucocytes so increased in number: 1. *Uninuclear granular lymphocytes* (myelocytes). 2. *Neutrophile cells, eosinophiles,* and *mast cells* (all much *increased* in number). 3. Often *dwarfed leucocytes* and *leucocytes* whose *nuclei* are undergoing *mitotic changes.* These are, however, not diagnostic of leucæmia. 4. Always *nucleated red blood cells,* often in large numbers.

The relative proportion of these cells varies greatly in the different cases. Sometimes the eosinophiles are greatly in excess, sometimes the mast cells, and sometimes the nucleated red blood cells. An intercurrent disease greatly changes the appearance of the blood. There is a marked diminution in the number of the white blood cells, and they rise again with improvement of the intercurrent malady.

Mixed forms of leucæmia are not common, although different writers describe individual cases.

Acute leucæmia is the name given to the disease when it runs a rapid course. Sometimes the whole duration of the disease is less than two months. Such cases are usually of the *lymphatic type,* in *young people,* and *large lymphocytes* are frequently present in great numbers.

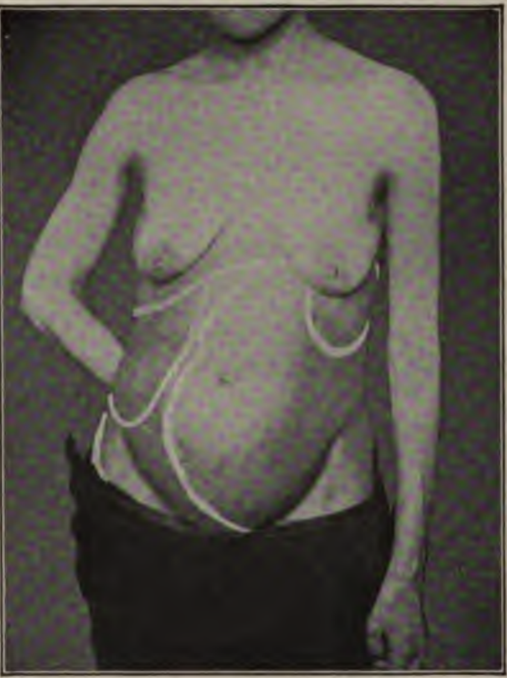

FIG. 121.—SPLENOMEDULLARY LEUCÆMIA. Outline of the spleen before and after treatment with x rays. (Dr. N. Senn.)

Prognosis.—Although the course of the disease is progressive, appropriate treatment may produce periods of temporary improvement. Acute cases may terminate in less than two months. The majority of cases prove fatal in from two to three years. Unfavorable signs are *persistent diarrhœa,* a tendency to *hæmorrhage, high fever,* and *early dropsy.*

Treatment.—The remedies given in this disease are usually those employed in pernicious anæmia. *Arsenic,* in increasing doses, seems to be the best drug. *Iron* and the *inhalation of oxygen* seem to be of value in some cases. *Quinine* is given in *malarial cases,* and *potassium iodide* and *mercury* in *luetic cases.* Organotherapy may be tried. Operative procedures are hardly advisable, owing to the tendency to hæmorrhage. Recovery from splenomedullary leucæmia following x ray treatment has been reported by Dr. N Senn, of Chicago (*Med. Record*, Aug. 22, 1903).

Pseudoleucæmia

Synonyms: Hodgkin's disease, lymphatic anæmia, adenia, general lymphadenia, pseudoleucocythæmia, malignant lymphosarcoma.

This disease is characterized by a general *hyperplasia* of one or more groups of *lymphatic glands* and by the presence of *anæmia*, and is frequently accompanied by *lymphoid growths* in the *spleen*, *liver*, and *other organs*.

Ætiology.—The origin of this disease is also obscure. The latest theories as to its causation are that it is of *infectious* origin, and that it is caused by a *local irritation* from which the glands in the immediate neighborhood are first involved. It occurs in the majority of cases in *young persons*, and three fourths of them are *males*. *Heredity* has been supposed to have some ætiological bearing. *Syphilis*, *malaria*, and other antecedent diseases have also been asserted to be ætiological factors.

Pathology.—The *lymphatic glands* in all parts of the body undergo an unequal *hyperplasia*, usually in the following order: the *cervical*, *axillary*, *inguinal*, *mediastinal*, *retroperitoneal*, and *mesenteric* groups.

The growth is gradual, the enlarged glands being at first soft and movable, then becoming hard and immovable and forming large masses which may invade the surrounding tissues, producing pressure symptoms. The glands nearest the skin sometimes undergo suppuration, and areas of necrosis may develop. On section, the mass is grayish white in appearance, at times firm and dry, at times soft and juicy. Microscopically, it is seen that the growth is chiefly confined to the *cells*, the reticulum sometimes becoming thickened and sometimes not.

Secondary growths of lymphatic tissue may be developed in different parts of the body, at the *base* of the *tongue* and in the *spleen*, *liver*, *kidneys*, *lungs*, *pleura*, and *spinal cord*. The *spleen* is enlarged in about three fourths of the cases, and in about one half of them there are grayish white tumors in its substance. It is never so large as the spleen of leucæmia. The *liver* and *kidneys* are often enlarged.

The changes in the blood are not marked, and they resemble those of ordinary anæmia. The *red cells* are *diminished* but seldom reach 2,000,000. The *leucocytes* are usually not increased in number. The *lymphocytes* may be more abundant than normally. *Nucleated red cells* may be present, but they are not so numerous as in leucæmia.

Symptoms.—The first symptom noticed is usually the *enlarged glands* in the *neck*, *axilla*, or *groin*, although the *anæmic* symptoms are occasionally the first to appear—*pallor*, *dyspnœa*, *hæmorrhages*, *œdema*, and *cardiac* and *cerebral* symptoms. As the glands become larger, *pressure symptoms* become manifest. The enlarged axillary glands, by pressing upon the brachial plexus, may cause swelling of the arm, and numbness, tingling, or pain along the course of the nerves affected.

The *trachea* may be obstructed from cervical enlargements, sometimes necessitating tracheotomy. *Bronchial lymphatic enlargements* may cause *pressure* upon the trachea, œsophagus, bronchi, vena cava, or aorta. There may be disturbances of the *heart, lungs*, or *stomach* as a result of pressure upon the vagi. *Abdominal pain, ascites, portal obstruction*, or *jaundice* may be caused by pressure of the enlarged retroperitoneal or mesenteric glands. Pressure upon the adrenals or upon the splanchnic nerves may cause *bronzing* of the skin. In involvement of the pelvic and iliac region *sciatica* and *swelling* of the *leg* are pressure symptoms. *Dyspnœa* may be due to the anæmia, to pressure upon the trachea, or to pleuritic effusion dependent upon mediastinal growths. *Fever* is present in most cases, and even in the early stages there is a slight rise of temperature. It may be of an irregular, hectic type, or continuous with evening exacerbations. Some patients have aguelike spasms which may persist for weeks or months.

Diagnosis.—Tuberculous adenitis is distinguished by being more common in the young, by our not finding tuberculous signs elsewhere in the body, and by the fact that tuberculosis usually first attacks the submaxillary glands, while pseudoleucæmia usually first involves the glands along the borders of the sternomastoid muscle. Tuberculous glands may remain in one region for years, become moulded together and commonly suppurate, while suppuration of the glands is rare in pseudoleucæmia, and there is a steady enlargement, with involvement of glands in other regions. Strict *limitation* of tuberculous glands to one side of the neck or to one axilla is usual. A blood examination will distinguish this disease from leucæmia. Occasionally pseudoleucæmia merges into a lymphatic leucæmia.

Prognosis.—The disease *usually ends fatally*, in acute cases in several months, and in chronic cases in from two to four years. Recovery is very rare, although periods of improvement and quiescence are not uncommon. Death results from *asthenia, hæmorrhage, pressure* of the *tumors, coma*, or some *intercurrent disease.*

Treatment.—In addition to every method of improving the general health by hygienic living, quinine, iron, and other tonics should be used. *Arsenic* is the best drug, and it may be given in gradually increasing doses up to the limit of tolerance. *Phosphorus* is probably the next best. *Iodine* internally, in five to ten drop doses of Lugol's solution after meals, is said to be of benefit. In the early stages, where there are only a few small glands, they should be removed. Local applications are of doubtful utility. X ray treatment may be tried.

SPLENIC ANÆMIA

This form of anæmia is found in infants and adults, and sometimes afflicts several members of one family. The anæmia is of a high grade, the leucocytosis is marked, the *spleen is large*, the liver is slightly swollen, and occasionally the lymph nodes are enlarged. The feature of the blood is the large number of *nucleated red blood cells* found.

The disease seems to differ from leucæmia by the disproportionate size of the spleen as compared with that of the liver, by the more moderate leucocytosis, by the more favorable prognosis, and by the absence of leucæmic infiltration of the viscera. This form of anæmia is probably secondary. Rickets, syphilis, chronic intestinal catarrh, and chronic tuberculosis have been mentioned as causes.

The **prognosis** is more favorable than in leucæmia, as size of spleen has no influence on the prognosis.

Treatment.—Intestinal irrigation, hygiene, proper diet, and tonic medication. Iron, arsenic, and any other therapeutic means which may be directed to any known underlying cause.

PURPURA AND THE HÆMORRHAGIC DIATHESIS

Under these symptomatic names are included those diseases or diseased conditions which have the common symptom of extravasation of blood under the skin or mucous membrane. The chaos met with in studying the literature of this subject is due to our lack of knowledge regarding hæmorrhagic manifestations. The author looks upon purpura mostly as an eliminative reaction of the organism to infection or autointoxication (intestinal toxæmia), and believes that the various forms of acquired hæmorrhagic diathesis are due to these causes. When purpura and the hæmorrhagic diathesis are manifest in the new-born, it is not unlikely that some form of infection or autointoxication of the mother has thus influenced the offspring.

Pathological Varieties.—Taking this view, we should expect and do find the following pathological varieties:

(*a*) INFECTIOUS PURPURA.—In acute yellow atrophy of the liver, typhoid fever, pneumonia, the exanthemata, pyæmia, septicæmia, malignant endocarditis, rheumatism, and malaria we may observe purpuric spots, from patches to ecchymoses. In typhus fever the rash is always purpuric. (*b*) TOXIC.—A purpuric eruption is observed following the use of certain drugs, such as copaiba, quinine, belladonna, mercury, ergot, chloral hydrate, and the iodides. The venom of snake bites and the poison associated with jaundice also belong in this class, as well as the toxines from intestinal putrefaction (scurvy). (*c*) CACHECTIC.—Cancer, tuberculosis, leucæmia, pseudoleucæmia, Bright's disease, and the debility of old age may cause hæmorrhagic spots, particularly upon the lower extremities. (*d*) NEUROTIC.—After fright, profound emotion, hysteria, hypnotism, and severe neuralgias, vasomotor relaxations sufficient to cause purpura have been observed, also following the paroxysm of pain in locomotor ataxia. They are present sometimes in other diseases of the spinal cord.

Clinical Varieties.—The ordinary clinical varieties are the following:

PURPURA SIMPLEX.—This is seen more commonly in children, and with or without pain in the joints. A crop of purpuric spots appears on the legs, sometimes on the body or arms. Diarrhœa is sometimes present, and usually there are loss of appetite and slight anæmia. There is seldom any fever. The duration is from seven to ten days.

PURPURA RHEUMATICA.—(Synonyms are *peliosis rheumatica* and *Schoenlein's disease*). Males are oftener affected than females, and it occurs more frequently between the ages of twenty and thirty. Although a history of rheumatism is frequently obtained, the relation of this affection to purpura is not understood. Usually the purpuric manifestation is ushered in by a sore throat, malaise, moderate fever, and multiple arthritis. The rash, usually first appearing on the legs or about the affected joints, may be a simple purpura, it may show urticarial wheals, or the two combined constitute the *purpura urticans*. There may be nodular infiltration which cannot be distinguished from erythema nodosum. Occasionally vesicles are present, producing the pemphigoid variety of purpura. Œdema is sometimes present, and it has been described as febrile purpuric œdema. The duration is usually from ten days to two weeks, but relapses are common and the disease may occur at the same time in several successive years.

The *diagnosis* is made by the association of rheumatic pains in the joints with purpura and urticaria.

The *prognosis* is very good.

Severe Forms.—The *severe forms of purpura hæmorrhagica* are known under various names, such as *morbus maculosus* (*Werlhoff's disease, Henoch's purpura, etc.*), and they are due to infection, intestinal putrefaction, and toxæmia. The subacute forms show a tendency to bleeding from the mucous membranes and into the viscera. A short period of malaise, slight fever, and pain in the joints precede the onset.

Purpuric spots, in size from that of a pin head to that of the palm of the hand, are present. Gangrene of the skin may follow extensive ecchymoses. Hæmorrhages, moderate or profuse, occur from the mucous membranes, most frequently from the nose, the kidneys, the intestines, and the uterus. The abdomen becomes rigid and severe vomiting may set in. Internal hæmorrhages into the brain and its meninges, into the lungs, or into the suprarenal capsules are not so frequent as in the very acute form. The spleen and liver may be enlarged and jaundice is not uncommon.

The gums may be normal or rarely swollen and bleeding, but the teeth are not loosened, as in scurvy. We exclude scurvy by a knowledge of the previous health, the circumstances under which it develops, the loosening of the teeth, etc. The blood may show changes of anæmia. It is most commonly met with in young and delicate individuals, particularly in young girls, and in adults in the cachectic stage of chronic ailments. Scurvy in children and adults belongs to this group. It may be defined as an acquired hæmorrhagic diathesis due to intestinal putrefaction and toxæmia.

The *prognosis* in children is usually good, but occasionally prostration is marked and the patient may pass into a typhoid condition and die. The duration is from a few days to several weeks. In cachectic adults the prognosis is less favorable, and is grave when associated with the cachexia of chronic renal, hepatic, or malignant disease.

Acute, or Fulminating, Purpura Hæmorrhagica.—In this form 75 per cent of the patients die. There is a chill, with fever rising to 103° or 104°, intense prostration, purpuric spots appearing rapidly, and bleeding from the mucous membranes. Alternating stupor, restlessness, and delirium supervene and the patient dies from hæmorrhage or in coma in from one to seven days.

Other patients may die from hæmorrhages into the viscera, the brain and meninges, or into the suprarenal capsules, in which cases there may be collapse and death in a few hours.

Treatment. PURPURA SIMPLEX.—Attention to the mode of life and the surroundings, fresh air, good food, hygienic methods to restore normal blood conditions, and tonics. High enteroclysis, practised once or twice daily, is a most important aid in the management of all forms of purpura. A complicating hæmorrhage from the bowel does not necessarily contraindicate a low bowel irrigation. Dilute hydrochloric acid, in 3 to 5 drop doses, should be given in sweetened water several times a day, also fruit acids. Arsenic in full doses seems to act best in children. No benefit is derived from small doses.

PELIOSIS RHEUMATICA.—The salicylates may be given with discretion in the rheumatic forms, although little assistance in controlling the hæmorrhage is thus obtained. For the hæmorrhages, aromatic sulphuric acid, alum, acetate of lead, gallic and tannic acids, ergot, and turpentine have been used. Oil of turpentine, in 10 to 20 drop doses three or four times a day, seems to be the best. Calcium chloride, in twenty grain doses four times a day for three or four days, has been advised to increase the coagulability of the blood. Gelatin in 2 per cent sterile solutions has been used subcutaneously, internally, and locally. The suprarenal extract, employed locally and internally, has often acted promptly. Epistaxis and menorrhagia may require tamponage. Stypticin, in 3 to 5 drop doses of a 10 per cent solution, may be tried. The management of scurvy in children is discussed in the pædiatric section of this book.

Hæmophilia; Hæmorrhagic Diathesis; Bleeders

The term *hæmophilia* is used to distinguish an abnormal tendency to capillary hæmorrhage, which may be hereditary or acquired. The so called "bleeders" cannot be distinguished from normal individuals by any characteristic external appearance. The bleeding may be superficial, interstitial, or into joints and cavities, and is usually of traumatic origin. The first manifestations are not usually seen until after the first year of life. Fatal hæmorrhage from the gums after tooth extraction or from trivial wounds and fatal post partum hæmorrhage are occasionally observed in bleeders, although the prognosis is not usually serious as regards life.

Treatment.—Known bleeders should be cautioned as regards the risks of operative interference and should be encouraged to lead an out of door life as conducive to overcoming the hæmorrhagic diathesis. Every effort should be made to give them a good digestion and to make the bowels move at least once a day, and a cold douche or a cold sponge bath should be added to the daily routine.

To check bleeding we employ rest, pressure, styptics, and internal medication. *Absolute rest in bed* is essential. Splints are necessary to insure immobilization in case of bleeding into joints, etc. Pressure may be manual and by means of gauze or rubber bandages, or a pledget of absorbent cotton soaked in alum water, or a 10 per cent antipyrine solution may be pressed or packed into accessible bleeding cavities, such as the nose, a tooth socket, or the uterus, and the actual cautery may be used to control bleeding points and surfaces.

DRUGS.—*Suprarenal* extract, locally and internally, is highly recommended, also *stypticin*, of which gtt. ij to iij of a 10 per cent solution may be given every half hour. Other useful drugs are aromatic sulphuric acid, gtt. v to x ter in die; acetate of lead, gr. ½ to ij ter in die; tannic or gallic acid, gr. ij to x ter in die; and oil of turpentine, gtt. x to xx ter in die. Gelatin in 2 per cent solution has been used locally, internally, and subcutaneously. Calcium chloride, in 20 grain doses four times a day for three or four days, has been advised to increase the coagulability of the blood before operations on suspected bleeders.

Remarks on Hæmorrhage, External, Internal, Visible, Invisible

The source of a visible hæmorrhage is usually easy of recognition, as in hæmorrhage from the surface, the nose, the throat, the ear, the eye, the uterus (menorrhagia and metrorrhagia), the bladder, the kidney, the stomach, the lungs, the rectum, the prostate, and the subconjunctival and subretinal spaces, etc.

A *concealed hæmorrhage* is one which gives no visible evidence, as in the thorax, abdomen, and pelvis. Hæmaturia in children is always the result of a rupture of blood vessels, and it is found under the same conditions as in adults and frequently in acute infectious diseases. To distinguish between hæmorrhage from the nasopharynx, stomach, and lungs is not difficult. Hæmorrhage from a typhoid ulcer usually shows itself in the stools. The symptoms of concealed hæmorrhage are those of collapse, with dyspnœa, restlessness, and often pain. The pulse is weak, the patient may be unconscious, and nausea and vomiting, with a rapid heart's action, are observed. Thus, we may have bleeding and rupture into the pleural or abdominal cavities (ectopic gestation and rupture, hæmatoma).

Intracranial hæmorrhage gives symptoms such as paralysis, paresis, aphasia, and coma. A concealed intestinal hæmorrhage may follow an injury, and purpura and hæmophilia may be the cause of various bleedings.

The clinical significance and management of various regional hæmorrhages are discussed elsewhere.

SEPTICÆMIA AND PYÆMIA (BLOOD POISONING)

Septicæmia is produced by the absorption of septic organisms and their ptomaines from any open wound or focus of inflammation. In *pyæmia* we observe, in addition to general septic symptoms, the *formation of metastatic abscesses*.

Septic intoxication is met with in obstetrical cases (see Puerperal Sepsis) and is occasionally observed in the wake of mild or severe inflammation of the nose and throat or takes its origin in small and insignificant abrasions of the skin.

The **symptoms** are those of septic infection: Restlessness, chills, high temperature, nausea, vomiting, a rapid pulse, and delirium. In some fatal cases the temperature is but little above the normal.

The **prognosis** is grave.

The **treatment** for all such conditions is identical: The portal of entrance should be kept clean, and abscesses must be opened and cleansed. The patient should breathe cold air and should receive a fever diet. Stimulation by means of enteroclysis, whiskey, and drugs is demanded (see General Therapeutics). Serum treatment for septic conditions is in the experimental stage.

CHAPTER XIV

THE CIRCULATORY SYSTEM—*Concluded*

CLINICAL FORMS AND THERAPEUTIC MANAGEMENT OF DROPSY AND EFFUSION

SYNOPSIS: Remarks on the Clinical Pathology of Dropsy and Effusion.—Anasarca, its Management.—Indications and Technique of Venesection.—Ascites.—Tapping.—Permanent Drainage, Operative Treatment.—Hydrothorax and Pleuritic Exudates.—Tapping the Chest.—Pericardial Fluid.—Tapping the Pericardial Sac.—Hydrocephalus.—Spina Bifida.—Tapping the Cranium and Spine.—Pulmonary Œdema (Acute and Subacute).—Collateral Inflammatory Œdema of the Glottis, Uvula, Anterior Mediastinum, Conjunctiva, Prepuce, etc.—Malignant Œdema.—Anthrax Œdema.—Œdema from Poisonous Bites.—Essential Dropsy without Albuminuria.—Œdema of the New-Born.—Myxœdema.—Unilateral Œdema from Thrombosis and Pressure, as in Milk Leg Fractures, etc.—Angeioneurotic Œdema.—Encysted Dropsy.—Retention Cysts.—Hydatid Cysts, Hydronephrosis.—Dropsy of the Gall Bladder.—Hydrosalpinx.—Hydrocele, Hydrocele of the Cord.—Dropsy of the Amnion.—Ovarian Cysts.—Pancreatic Cysts.—Mesenteric Cysts.—Hygroma.—Serous Abscesses.—Dropsy of Joints and Tendons.—Résumé of Diagnostic Punctures.—Points of Puncture.—Gross Character of Puncture Fluids.—Cytodiagnosis.

GENERAL REMARKS; ŒDEMA

Œdema is a disturbance in the equilibrium of the inflow and outflow of lymph from various causes, such as venous obstruction (in the liver, kidneys, lungs, spleen, etc.), cardiac feebleness, pressure of tumors or exudates in the pleura or pericardium, tissue inflammation, angeioneurotic disturbances, etc. The state of nutrition of the capillaries and a peculiar blood composition (hydræmia) are also factors in the production of dropsical phenomena.

Œdematous swelling usually begins in loose tissue. In venous stasis in the thorax the pressure in the left subclavian vein (where the thoracic duct is situated) is increased, the flow of lymph impeded, and œdema favored.

Œdematous fluid is poorer in albumin and leucocytes than lymph. Lymph saturating the tissues is simply a transudate from the blood, and finally it reenters the venous circulation through the thoracic duct.

A serofibrinous *inflammatory* exudate, such as occurs in pleurisy, etc., is much of the nature of stasis œdema, but is richer in corpuscular elements and fibrin than ordinary stasis œdema.

We are occasionally unable to distinguish clinically between stasis and an inflammatory œdema. Thus, we find inflammatory œdema in the lungs in pneumonia and tuberculosis. The pulmonary œdema of nephritis is most probably a stasis phenomenon. Acute laryngeal œdema and chemosis of the conjunctivæ are probably of the inflammatory variety.

The general œdema of acute and chronic Bright's disease is not altogether stasis œdema, but is the result of various factors, such as hydræmia, heart insufficiency, water retention, and changes in the walls of blood vessels.

The dropsies of cachexia and of central nervous disease have not been thoroughly cleared up. The same may be said of the so called *essential* and *neurotic* œdemas. Chronic œdema resulting from permanent occlusion of blood vessels is known as stasis œdema.

Œdema may be symmetrical, circumscribed, or diffuse. When areolar tissue is œdematous, we speak of anasarca; when serous cavities are involved, we speak of hydrothorax, ascites, hydrocephalus, hydrarthrosis, etc.

All forms of œdema should be looked upon as pathological, except perhaps the swelling of the ankles in persons who stand or walk much, but are otherwise in good health. From this variety to the "waterlogged" individual, all forms are encountered in general practice. Dropsy in any form is generally a source of anxiety and apprehension to the sufferer, and demands the full attention of the medical practitioner. The treatment of dropsy is *general* and *local* with due regard to the underlying cause.

ANASARCA; GENERAL ŒDEMA

In most diseases, organic or otherwise, which end in cardiac insufficiency or cachexia and hydræmia, a dropsical condition of the body or its dependent parts will ultimately develop. This dropsical condition of the tissues will be more or less symmetrical, that is, affect both sides of the body, in contradistinction to *localized œdemas due to local disturbances*. Although cardiac dropsy usually first shows itself at the ankles, and renal dropsy at the upper part of the body (puffy eyelids, etc.), such phenomena should not be relied upon for a snap diagnosis. On the contrary, a careful clinical inquiry or examination must at once be made and the primary cause of the dropsy elicited.

General Management

The general management of dropsy as a symptom includes tonic treatment, hydragogue cathartics, diuretics, heart tonics, "dry living," sweating, and venesection.

Diuretics and heart tonics are often of great service and may be used as follows:

Infusion digitalis (gr. xxx to ℥jv), a tablespoonful every two, three, or four hours. To each bottle of infusion half an ounce of acetate of potassium and some syrup may be added. Or the following may be given:

℞ Pulv. digitalis,	gr. ij;
Camphoræ,	gr. ij;
Flor. benzoes,	gr. v.

M. Sig.: Three to four such powders each day.

Camphor is a valuable heart tonic and diuretic. Ten to fifteen drops of camphor in oil (15 per cent) may be given subcutaneously. *Potassium iodide* acts as a diuretic. In some cases twenty grains in two ounces of warm water may be administered per rectum two or three times a day. To prevent iodism, ten grains of *chlorate of potassium* may be added to each dose of the iodide. *Diuretin*, in half drachm doses, may be given four times a day, or five grains of *benzoate of sodium* and *caffeine* three times a day.

The following is also effective:

℞ Tinct. digitalis, ... ʒij;
Sol. nitroglycerini (1 per cent), ... ʒj;
Tinct. strophanthi, ... ʒj.
M. Sig.: Fifteen drops four times a day.

In children the doses are proportionately smaller.

Sweating in Anasarca.—Sweat boxes of all sizes and shapes are obtainable. In the absence of a hot air apparatus, the patient is placed nude on a chair and covered with a large blanket. Underneath the chair a lighted alcohol lamp is placed. Hot air may also be conducted under the blankets while the patient is in bed, by means of a sheet iron oven with a spout and an alcohol lamp; or the patient may be placed in a bathtub closed by means of a heavy blanket, so arranged that the head is free. "Waterlogged" patients should live on a *dry diet*, and take just enough liquids to quench thirst.

. Water may be removed from the body by means of hydragogue cathartics, such as *calomel, gr. x, and podophyllin, gr. $\frac{1}{3}$ to $\frac{1}{2}$*, or blue mass, gr. x and podophyllin, gr. $\frac{1}{4}$ to $\frac{1}{2}$, with the addition of aromatic powder to prevent griping, such a dose to be taken once a week. Another plan is to give sulphate of magnesium in teaspoonful doses, as follows: 1st day. One teaspoonful every hour until about fourteen stools are secured. 2d day. Rest. 3d day. Sulphate of magnesium. 4th day. Rest, and so on until the dropsy is gone. In some cases this treatment exhausts the patient and must be discontinued. Elaterin, in $\frac{1}{15}$ grain doses, may be given every 3 to 6 hours for several days and the treatment continued with heart tonics, such as digitalis, strychnine, opium, etc.

Venesection in Dropsy.—Whipping up the heart by stimulants, aided by cathartics and sweating, is effective so far as it goes. In cases in which the desired effect is not obtained after a reasonable time, it is useless to continue without at the same time relieving the heart by venesection. The benefits of bleeding are twofold: 1. The relief of vascular engorgement. 2. The removal of some of the toxic products which have accumulated in the blood as a result of insufficient elimination from failure of the emunctories. The technique of venesection is described in the chapter on General Therapeutics.

ŒDEMA OF THE LOWER EXTREMITIES

The presence of œdema in the lower extremities is not an urgent symptom, since it does not tend, like hydrothorax, to aggravate the failure of the circulation, the two conditions acting and reacting on one another. There is less necessity for tapping in œdema of the lower limbs, but there are cases where it may prove of service by relieving pain and excessive tension. Before we scarify or drain a limb it may be wise to attempt to influence the œdema of the extremities by elevation, mild massage, or an elastic bandage *in connection with the constitutional treatment outlined above.*

Elevation of a limb is readily secured when the patient by choice or necessity is confined to his room or is limited in his excursions to the veranda or garden. For patients who are up and about, *pressure* can be utilized to overcome œdema of the feet. The writer prefers an elastic bandage to the rubber stocking. The rubber roller bandage should be three inches wide and from four to five yards long. A thin cotton stocking, with the toe end cut off, is first put on and the bandage is evenly applied, without much stretching, from the toes to the bend of the knee. The bandage is applied on rising in the morning and taken off on going to bed. This is also good treatment for varicose veins.

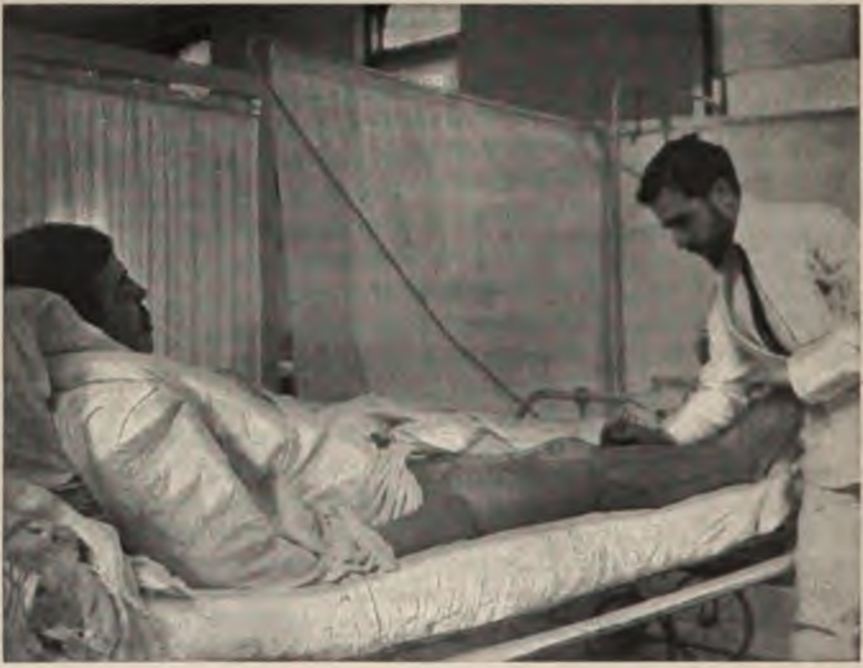

FIG. 122.—LONGITUDINAL SCARIFICATION FOR ŒDEMA.

Massage is a valuable aid in the management of œdema, particularly in connection with the hot air treatment.

Scarification and linear incision are useful methods. After thoroughly cleansing the skin with green soap and carbolized water, a puncture or linear scarification is done with an aspirating needle or scalpel, and the watery exudate is absorbed by a sterile cheesecloth dressing. There is always some risk from secondary wound infection by this method, but with great care this can be avoided. Fluids may be removed from punctured or scarified œdematous tissue by means of cupping glasses or the vacuum aspirator.

ASCITES

Ascites is an accumulation of fluid in the peritoneal cavity. It may be free or sacculated. If it is free and the patient is on his back, the fluid will give dulness on percussion, and the line of dulness will change with a change of the patient's position. If the abdomen is not well filled, its centre is resonant on percussion on account of air-containing intestines floating on top. A small amount of fluid may be made out by placing the patient in the knee-elbow position and eliciting dulness on percussion from below about the region of the umbilicus. When considerable fluid is present, a fluctuation or percussion wave may be elicited by bimanual manipulation. The character of the fluid is made out by means of the aspirating needle or syringe.

Differential Points.—*Pregnancy, ovarian cysts, a distended bladder, omental cysts,* and *hydatid* and *pancreatic cysts give dulness over the centre of the abdomen or wherever they are located and tympanitic resonance in the flanks.* A free serous effusion in tuberculous peritonitis gives the same physical signs as ascites from other causes.

Cysts and ascites may coexist. A laboratory examination of an aspirated fluid will often distinguish between ascites and ovarian cysts, but occasionally an exploratory laparotomy must be done to establish an exact diagnosis. Hæmorrhage from a ruptured tube or ovary may give rise to physical signs of free fluid in the abdomen.

In simple free ascites the history shows gradual uniform enlargement of the abdomen with flattened sides. The prominent navel with enlarged superficial veins, the fluctuation wave, the dull percussion sound as compared with the tympanitic intestinal sound, the movable dulness on change of the patient's position whenever sufficient free fluid is present, and the character of the fluid obtained by puncture, clear amber, greenish, chylous, or bloody, will aid in establishing the diagnosis.

Ascites without general œdema is most commonly due to cirrhosis of the liver or other portal obstruction (tumors). *Ascites plus œdema is generally due to renal or cardiac disease.*

Management of Ascites

If the ascites can be influenced by drugs (digitalis in heart failure, iodide of potassium and mercury in syphilis, or quinine in malarial spleen), such treatment should be adopted and reenforced by cathartics, sweating, massage, and general tonic management. If not, the fluid must be removed by tapping and repeated tapping in order to relieve embarrassment of the heart and kidneys.

Tapping is done in the median line or the lateral aspect of the abdomen. The patient is placed in a comfortable armchair with a bucket between his feet and a rubber apron over his legs. The parts are cleansed and local anæsthesia is secured by means of chloride of ethyl spray or cocaine, a few drops of a 4 per cent solution being injected under the skin. A *small incision through the skin facilitates the introduction of the trocar.* To prevent blocking of the cannula by loops of intestine (after some of the fluid has come away), the author has devised and uses a trocar with a sievelike end.

To prevent syncope, the fluid should be allowed to run out slowly, and the patient may take coffee and whiskey. When all or nearly all the fluid has flown out, the wound is secured by a pad of bichloride gauze and a strong binder, and the patient put to bed.

Should the trocar strike a large vessel (which is a rare occurrence), and a free and profuse hæmorrhage ensue, the abdomen must be opened and the bleeding vessel secured. If the patient is comfortable after tapping, the abdomen may be explored through the lax abdominal walls, and doubtful diagnostic points may be made clear. Before tapping the bladder should be emptied.

Permanent drainage of the abdomen for ascites was first suggested by the writer in 1886. A rubber catheter is introduced into the abdominal cavity through the cannula of a large trocar or through an incision. The protruding part of the rubber tube is secured to the abdomen by means of straps of rubber zinc plaster, and the end of the tube is clamped so as to permit of a periodic flow or removal of fluid, or it may drain into a receptacle if the patient is compelled to remain in bed. Drainage can be kept up for weeks, and in the event of the establishment of a good collateral circulation, improvement of the underlying condition for long periods has been observed and reported. For particulars regarding this method, the reader is referred to the author's original communication in the *New York*

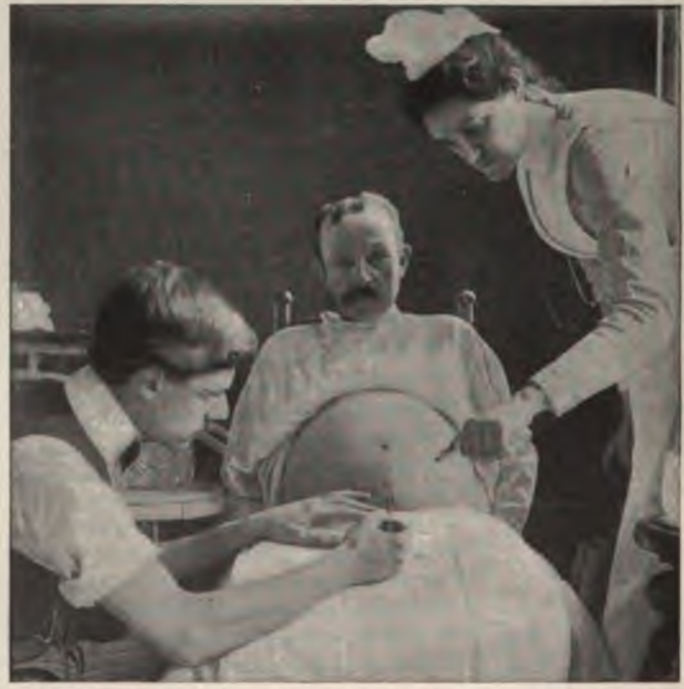

FIG. 123.—TAPPING THE ABDOMEN UNDER LOCAL ANÆSTHESIA. (See Ascites.)

Medical Journal, February, 1886, and to subsequent reports by others who have used this method. In recurrent ascites from cirrhosis of the liver permanent drainage is of value. The collateral circulation eventually established takes place by reason of the anastomoses of the portal vein with the superior cava and the azygos vein.

Operative Treatment for Ascites.—The artificial establishment of vascular anastomosis has been attempted by attaching a piece of omentum, about two inches square, to the abdominal wall by catgut or kangaroo tendon stitches. Adjacent peritoneal surfaces over the liver have been scarified and made adherent, and the spleen has been fixed to the abdominal wall.

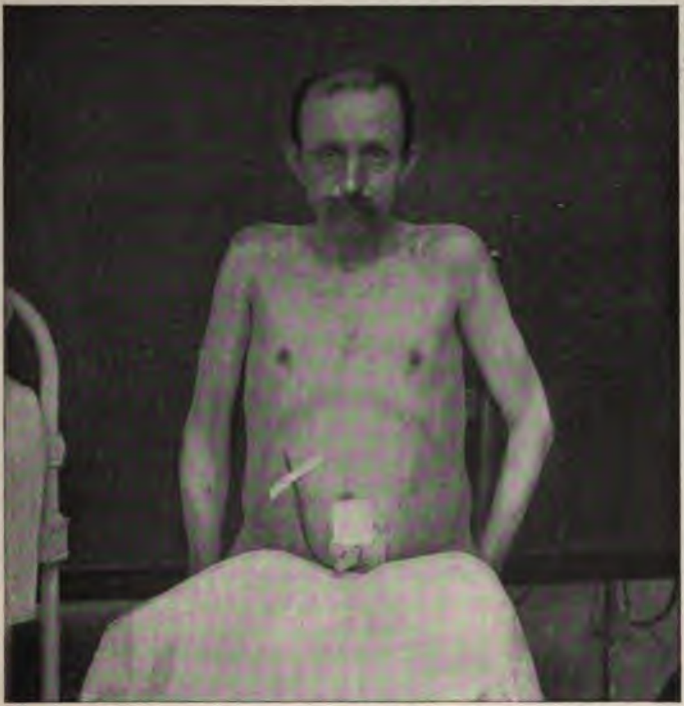

FIG. 124.—PERMANENT DRAINAGE FOR ASCITES. (Author's Method.)

HYDROTHORAX; PLEURITIC EFFUSION

Signs.—The rational signs of fluid in the chest are a feeling of resistance on percussion, dulness or flatness on percussion, a tympanitic percussion note above the fluid level, dulness on the right side, continuous with that of the liver, the respiratory murmur indistinct or absent (or distant bronchial breathing may be heard), and bulging of the intercostal spaces on deep inspiration. In doubtful cases an exploratory puncture may be necessary to establish the presence and character of the fluid. Dyspnœa is the principal symptom in pleuritic effusion, and displacement of the heart and crowding up of the lung into the apex space are often observed.

Thoracocentesis.—Fluid in the thorax, whether unilateral or bilateral, can easily be removed, but this should not be done simply because of its presence. Embarrassed respiration and embarrassed heart's action of a severe type are the indications for operative interference. Thorough cleanliness must be observed in the various manipulations incident to thoracocentesis. The patient is stripped to the waist and made *to straddle a chair with the arms resting on a pillow* over the back of the chair. If necessary, the chest can be tapped with the patient sitting or reclining in bed. After determining that the chest contains fluid, the part selected for puncture is cleansed and the exact spot (seventh or eighth interspace) made anæsthetic by the chloride of ethyl spray or a subcutaneous injection of 4 per cent cocaine solution. For aspiration the author prefers the suction apparatus with a bottle. The patient is told not to move and assured that there will be very little pain (children are firmly held). The needle is then introduced. The operator should hold the needle loosely between the thumb and index finger, and the suction pump is to be worked by an assistant. Whenever *the needle is felt to scrape the lung surface,* its point *should be raised or depressed, or slightly withdrawn to make it free.* The patient is enjoined not to talk and to suppress coughing if possible. If a trocar is used instead of a needle, a preliminary small incision through the anæsthetized skin is advisable.

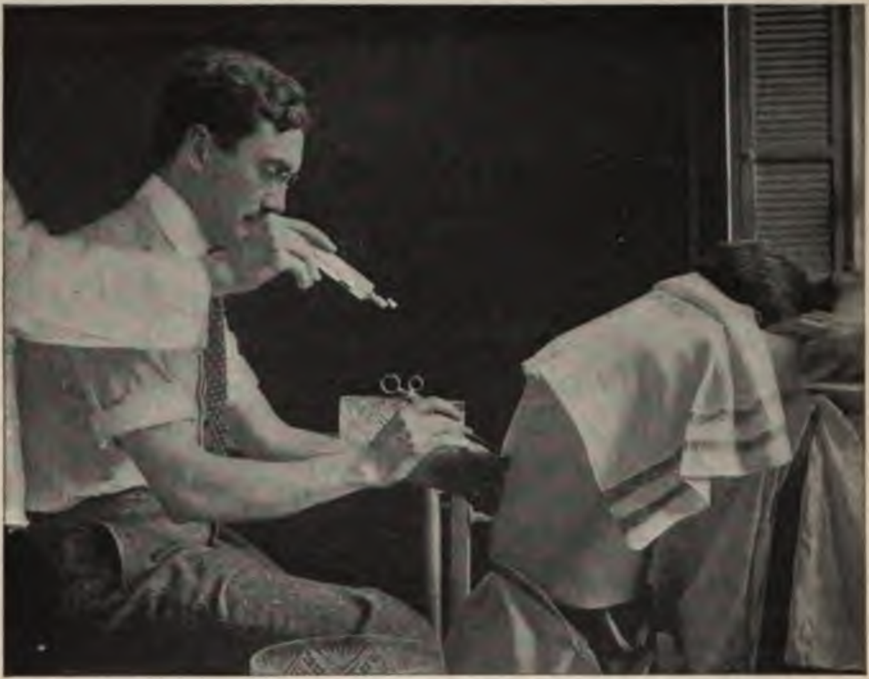

FIG. 125.—EXPLORATORY PUNCTURE OF THE CHEST UNDER ETHYL CHLORIDE LOCAL ANÆSTHESIA.

When the fluid ceases to flow, or when uncontrollable coughing sets in, toward the end of the operation, the needle or trocar should be withdrawn and the wound secured with a compress of sublimate gauze and a binder. If, for any reason whatsoever, prolonged aspiration is out of the question in children or adults, enough fluid may be removed to temporarily relieve intrathoracic pressure.

When the pleura is thick and a large trocar is used, it sometimes happens that the thickened membrane is stripped from the chest wall or simply pushed forward, in which event no fluid will flow. The trocar should be withdrawn and a large needle used instead. A *calcified* pleura makes it impossible to introduce a needle. Pneumothorax, subcutaneous emphysema, and pulmonary hæmorrhage following puncture of the chest are rarely encountered by careful operators. After the needle is once in position, lateral movements of the same are to be avoided.

In tapping the chest it is well to remember that a line drawn horizontally from the nipple around the chest passes over the sixth intercostal space midway between the sternum and the spine. This rule may prove serviceable in stout people in whom it is difficult to count the ribs.

Non-inflammatory hydrothorax is unilateral or bilateral in cardiac and renal disease or in any form of cachexia or in arteriosclerosis, etc. In some instances a pint or even a quart of fluid in each side of the chest will give but little discomfort, and need not be removed. In other cases, particularly in heart disease, the removal of half a pint or a pint of fluid will give much relief.

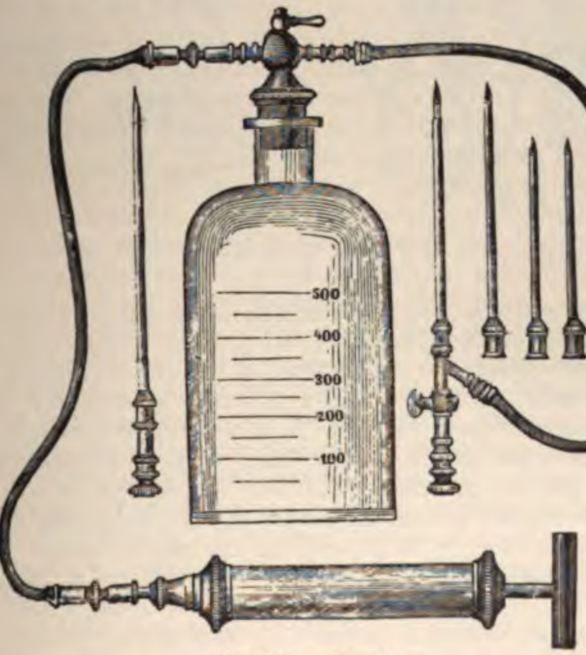

FIG. 126.—ASPIRATOR.

The *inflammatory exudates are serous, seropurulent, sanguinolent*, or *purulent.* Their occurrence and management are discussed in the chapters on Pleurisy and Pyothorax.

Seropurulent exudates may be aspirated *once,* and, if they reaccumulate, free incision and drainage are indicated. The *purulent* variety is treated like any other abscess, i. e., by free incision, with or without resection of a portion of a rib, to secure good drainage.

Pericardial effusion varies in composition and character precisely as does pleuritic effusion. In general dropsy, serum may be found. In inflammatory pericardial effusion the fluid contains more fibrin or corpuscular elements, blood, and pus. As the diagnosis is discussed under Pericarditis, we shall speak only of the indications and method of tapping.

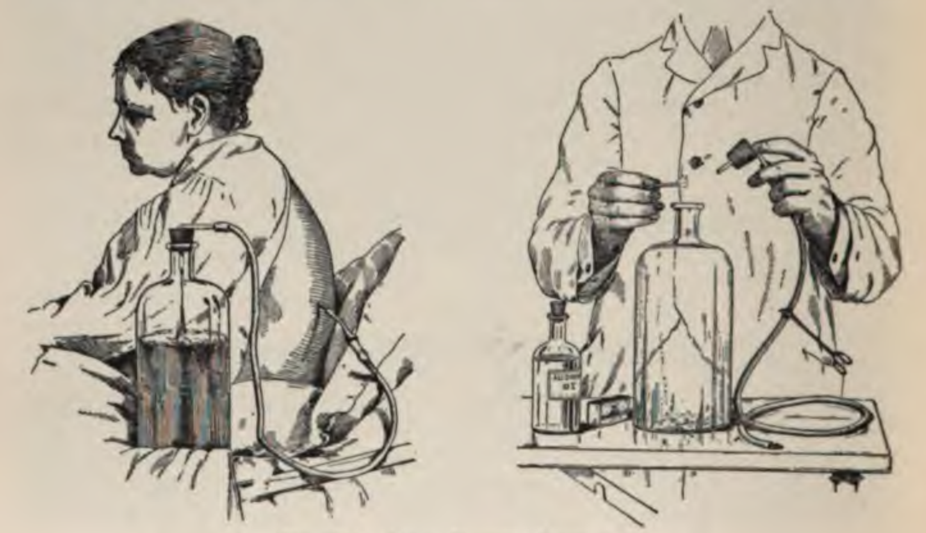

FIG. 127.—HEAT VACUUM ASPIRATOR.

INDICATIONS.—Whenever the effusion in the pericardium is so massive as to interfere with the heart's action and thus *threaten life,* it should be removed, be it serum, blood, or pus. Thus, we may be compelled to operate in violent acute cases and in chronic cases with no absorption. The instrument to be used is a medium sized trocar in connection with an aspirator. It is not wise to employ an ordinary sharp pointed aspirating needle, owing to the danger of scratching or puncturing the moving heart.

The parts are disinfected, anæsthetized, and incised as in thoracocentesis. The needle is introduced two inches and a quarter to the left of the median line of the sternum, preferably in the fifth interspace, near the junction of the sixth rib with the cartilage, or in the fossa between the ensiform cartilage and the costal cartilages of the left side. The patient should be in bed or sit and lean back. In counting the intercostal spaces, we must remember that the first rib lies under the clavicle. After the fluid has been removed the small wound is closed as in puncture of the chest. A careful manipulator will endeavor to avoid wounding the internal mammary artery or puncturing the auricle. The admission of air should also be prevented. The operation not only is palliative, but may be followed by substantial improvement. If the fluid reaccumulates, the operation may be repeated. If pus is formed in the pericardial sac, incision and drainage are indicated as in pleural empyema.

An *ignition vacuum bottle* for aspirating fluids was suggested by Dr. Carl Connell in the *Medical Record* for July 4, 1903. Three drachms of 95 per cent alcohol are poured into the bottle, which is then turned until the entire surface is coated. The excess of alcohol is poured off. The bottle is then placed upright and ignited at the mouth before the film of alcohol has time to dry or settle. (See Fig. 1.) A sheet of flame descends into the bottle, varying in time for complete ignition from a fraction of a second to several seconds, depending on the strength of the alcohol and the temperature of the glass. As the flame touches the bottom, the bottle is quickly corked. On attaching the needle the aspirator is complete. It may be employed for the aspiration of cavity fluids and tissue fluids (œdema of the scrotum).

Aspiration from the Patient's Standpoint

The following article on "Aspiration from the Patient's Standpoint," by Walter Bensel, M.D., may be of interest here:

"Shortly after the blizzard of a few years ago I contracted a pleurisy with effusion from exposure during the storm. The effusion became so large and caused such considerable dyspnœa, dysphagia, and displacement of the heart that it was deemed advisable to aspirate and withdraw some of the fluid. The first needle that was introduced was a small hypodermic syringe needle, simply for diagnostic purposes. The only thing that I observed at this time was that the pain was much more considerable than I had supposed it would be. Soon afterward another, larger sized needle was introduced to remove the fluid, and then I noticed that there were two distinct sensations of pain, equal in intensity, but different in character, one as the point of the needle passed through the skin, and the other just before the fluid was reached. The second was precisely the same as the 'stitch in the side' felt with a dry pleurisy. A reaccumulation of serum occurring in a few days, a needle was again introduced. Only a small amount of fluid was removed before the lumen became obstructed in some way, and the needle was withdrawn and reintroduced in another situation. A few minutes before each of these two aspirations, a 4 per cent solution of cocaine was injected hypodermically, so that no pain was felt as the needle passed through the skin. The same degree of pain occurred as before, however, when the needle passed through the pleura. These facts would seem to indicate that the pleura possesses nearly, if not quite, as great sensibility as the skin itself." SLOANE MATERNITY HOSPITAL, *December* 16, 1891.

ACUTE AND CHRONIC HYDROCEPHALUS; HYDRENCEPHALOID, OR WET BRAIN; CRANIAL AND SPINAL PUNCTURE

Hydrocephalus is an accumulation of serous fluids within the skull. We distinguish *internal*, or ventricular hydrocephalus and *external*, or arachnoidean, hydrocephalus. These forms may be acute or chronic and congenital, acquired, or symptomatic.

Acute Hydrocephalus is often suspected in children when, in the course of various diseases, cerebral excitement develops, which may be followed by a stage of depression terminating in death. It is found as a complication in eruptive fevers and infectious disease, in obstruction to the venous circulation in the cranium, as a result of traumatism or compression of the jugular vein, or in cardiac or renal disease. A sudden effusion, or *serous apoplexy*, is a well known clinical variety, as is also the convulsive attack associated with Bright's disease. As ordinarily observed in children or adults, there are fever, headache, photophobia, insomnia, delirium, muscular restlessness and contracture, convulsive stupor, and often death.

Spurious Acute Hydrocephalus, or Hydrencephaloid (wet brain) is a comatose condition often seen in exhaustive infectious diarrhœas and in delirium tremens.

Chronic Hydrocephalus.—Its *ætiology* is not clear. Judging from the nature of the superabundant fluid, which is poor in albumin, it is not usually the product of active inflammation. Enlargement of the head and nervous manifestations are characteristic. The eyes are prominent, and often there is nystagmus of the horizontal or vertical type, also head nodding. The head is heavy, and the extremities are feeble, as in rickets. The children cannot walk or stand, and the head is elastic on pressure. Large, rhachitic heads may be mistaken for the hydrocephalic type, and rhachitis and hydrocephalus may be combined.

The course of hydrocephalus is slow and progressive. Spontaneous cures are occasionally observed. An unfailing evidence of increased intracranial pressure is the choked disc, as revealed by the ophthalmoscope. At times exacerbations of the symptoms are noticed. The special senses are fairly acute, but the intelligence is below normal. Some cases are of ten to fifteen years' duration, but many of the patients die about the first year of life.

Treatment of Both Varieties.—In both the acute and chronic variety an attempt should be made to direct the therapeutic efforts to any suspected underlying cause. Thus, if syphilis is suspected, iodide of potassium may be administered per rectum, in cerebral œdema due to heart failure from any cause cardiac tonics are indicated, and in the chronic type all manner of hygienic, dietetic, antirhachitic, and blood improving measures (iron, arsenic, phosphorus) should be tried.

For diagnostic purposes, and for relieving pressure symptoms, the fluid may be removed by tapping the cranium or by spinal puncture, although very little benefit results therefrom.

TAPPING THE CRANIUM AND SPINE.—The hydrocephalic cranium may be tapped with a trocar or needle at the site of the large fontanelle, an inch from the median line, or by trephining in the occipital region. A deep vertical puncture will reach the ventricle; a puncture of moderate depth will reach an external fluid accumulation. From one to four ounces may be removed repeatedly, without observing untoward effects or marked improvement.

The puncture must be done under strict antiseptic precautions (shaved *scalp)*. On removing the needle, a pledget of bichloride gauze secured by adhesive strips should be applied or the collapsed head bound up by roller bandages. Injections into the cranium to set up adhesive inflammation are useless and may result in harm. The author has injected iodoform, potassium iodide, sodium salicylate, and lysol for therapeutic purposes into the spinal canal without observing any benefit.

Spinal Puncture.—The back of the patient is cleansed and disinfected with green soap and iodoform, ether, or corrosive sublimate solution, 1 to 2,000. With clean hands the operator introduces a boiled "antitoxine" needle between the third and fourth, or fourth and fifth lumbar vertebræ. An imaginary straight line from the crest of one ilium to that of the other will usually cross the desired interspace. The exact spot may be marked on the skin with the finger nail. The puncture is made in the median line in children or a little to the right of the median line in adults. The direction of the needle is forward and slightly upward. If fluid is to be withdrawn for examination in the laboratory, it should be collected in a sterile glass tube, which is to be sealed by means of a flame. Local anæsthesia is advisable in adults and children, and the patient must be securely held in the proper position in order to avoid breaking the needle or injuring deep and important structures. (See also Pædiatrics.)

Normal cerebrospinal fluid is perfectly clear. In meningitis it is cloudy. In tuberculous meningitis it is usually perfectly clear.

The differential diagnosis between the various forms of meningitis is made by microscopical examination of the sediment, the culture, or the *inoculation focus*.

ACUTE AND SUBACUTE PULMONARY ŒDEMA

Diagnosis.—The diagnosis depends mainly upon the presence of numerous moist or dry râles and percussion dulness of the base of the lungs, indicative of an effusion of serum into the air cells. When localized, it is usually inflammatory or collateral; when general, it is generally a stasis phenomenon. The diseases with which pulmonary œdema is most commonly associated are pneumonia, acute and chronic nephritis, cardiac disease, acute specific fevers with circulatory failure, cerebral apoplexy and injuries, and cachexia from any cause.

Symptoms.—The symptoms are dyspnœa, cyanosis, cough, frothy and blood-stained expectoration, a rapid pulse, a cold surface, and coma.

A rise in temperature is usually observed in cases which respond to stimulants (fever of absorption). Pulmonary œdema is often mistaken for acute pneumonia in the early stage. This is an unfortunate mistake, because at this time active measures, such as are not indicated in incipient pneumonia, may save life. In incipient pneumonia the auscultatory phenomena are generally one sided. There is often localized pain, and the dyspnœa is not so great as in general pulmonary œdema, in which the auscultatory phenomena are heard over the entire chest and sometimes posteriorly and anteriorly up to the apex.

The most distressing form of *acute pulmonary œdema* is that which comes on quite suddenly and utterly overwhelms the patient in half an hour's time. The following cases, briefly told, will fairly illustrate this form of pulmonary œdema, which is supposed to be due to paralysis of the left heart and strong action of the right heart in the presence of changes in the capillary walls.

A young lady, twenty-four years of age, had contracted rheumatic fever and endocarditis at the age of seven. She had another attack of rheumatic fever at the age of twelve. She remembered having been short of breath since childhood, and having had to leave school at the age of twelve. She always felt tired and weak. At the age of twenty she had a severe attack of diphtheria, on which occasion the valvular heart lesion was diagnosticated as stenosis of the mitral valve. For four years her appetite had been capricious, but the tongue was clean. She suffered from palpitation and dyspnœa after eating. She had slept poorly for the preceding eighteen months, complaining of palpitation and dyspnœa at night. During the day she was unable to lie down, on account of the palpitation, dyspnœa, and short, dry cough. She had to discontinue wearing corsets, and could not walk a block without resting. If she exercised after eating, she became nauseated and would often vomit. She was constipated and laxatives distressed her. Very recently she had had profuse night sweats. Her general appearance, however, was satisfactory and she looked well nourished.

Her first attack of acute pulmonary œdema came on at night soon after she went to bed, and at the time of menstruation. Menstruation was usually profuse, lasting from four to seven days. The attack was ushered in by extremely rapid action of the heart (tachycardia). Very soon there was urgent dyspnœa, with cough and a sensation of constriction of the chest. Auscultation at this time revealed moist râles in all parts of the lungs. In a few hours a pink froth oozed from the mouth, and the patient became comatose. Toward morning consciousness returned, and a hand's breadth of dulness on percussion was elicited over both lower lobes (œdema). The temperature, which had been normal before the attack, rose to between 102° and 103° on the following day, and gradually came down to normal (absorption fever). The liver was also enlarged and painful to the touch after the attack. The arm was partially paralyzed, and vision was cloudy. At no time was there engorgement in the peripheral veins. The first of these attacks occurred on January 5, 1888; the second in February; the third in May; the fourth in June; and the fifth in July. The sixth, which occurred in September, from 11 P.M. to 2 A.M., ended in death.

There was no evidence of nephritis or dropsy, except a puffiness under the eyes on one or two occasions. The valvular obstruction and a failing heart muscle caused the attacks, which were invariably ushered in by suddenly developing tachycardia, or "heart hurry."

The treatment in this case was the general management discussed under Chronic Cardiac Insufficiency, plus the treatment of the acute attacks.

To relieve dyspnœa, it was necessary to give morphine and opium as follows:

℞ Morph. sulph.,	gr. ¼;
Tinct. strophanthi,	gtt. xx;
Spir. æth. comp.,	gtt. xl;
Aq. menth. pip.,	ad, ℥jv.

M. S.: A teaspoonful every twenty minutes until four spoonfuls are taken.

℞ Ext. digitalis fluidi, ... gtt. ij;
Tinct. opii, ... gtt. v.
M. S.: For subcutaneous injection every four hours.

℞ Morph. sulph., ... gr. $\frac{1}{4}$;
Atropin. sulph., ... gr. $\frac{1}{500}$.
M.: To be used subcutaneously.

The heart was stimulated by means of strychnine, gr. $\frac{1}{30}$, every half hour, or nitroglycerin, gr. $\frac{1}{100}$, or caffein. sod. benzoate, gr. iij to v, alternately, every half hour. Camphor in oil (1 to 15) was given subcutaneously. Dry cups and turpentine stupes were applied to the chest, and ice to the heart. Oxygen inhalations had no effect. On the day following the attack, the patient received an enema, with general massage, and potassium iodide per rectum (gr. x twice daily).

In other similar cases, one in a fat woman with chronic nephritis, the other in a woman afflicted with insufficiency of the mitral valve and addicted to morphine (the attack coming on four weeks after childbirth), *recovery was prompt after venesection* and *heart stimulation.*

Acute pulmonary œdema is also observed in the moribund stage of typhoid fever and in persons afflicted with arteriosclerosis involving the kidney. The attacks come on after slight exertion, and subside in from half an hour to two hours. Dyspnœa is marked, the breathing and pulse are rapid, and moist râles are heard all over the lung. The lung sounds are dull. The distress is more intense in patients whose breathing space is diminished from former exudative pleurisy with adhesions, which compress or bind down the lungs. The high arterial tension in these cases can be overcome temporarily by venesection. Morphine subcutaneously will relieve dyspnœa.

The subacute forms are not so sudden in the onset and not so distressing in the beginning. As a type of this variety, we may mention pulmonary œdema with slow progressive heart failure. In some instances opium or morphine, by quieting a tumultuous heart, will be helpful in cases of pulmonary œdema in adults. In children, as in adults, sudden acute pulmonary œdema may occur without assignable cause.

Inversion and artificial respiration have been successfully practised in such cases, with massage movements from the middle of the body toward the head. Children with pulmonary œdema and sound hearts have a wonderful recuperative power and frequently recover after having had a pulse of 180 and respirations of 60 for two days.

Aseptic ergot may be employed in pulmonary œdema, wet brain, opium poisoning, shock, and insomnia.

℞ Ext. ergotæ fluid (Squibb), } āā, ... ℥jv;
Aquæ distillat., }
Formalin, ... gtt. ij.
M.: Dose, 15 to 30 drops, subcutaneously.

COLLATERAL, OR INFLAMMATORY, ŒDEMA

Collateral pulmonary œdema associated with pneumonic inflammation has been discussed.

Œdema of the Anterior Mediastinum.—The writer has observed two such cases in adults, one afflicted with cancer and perforation of the œsophagus, the other with visceral syphilis. During life a circumscribed dulness in the mediastinum was distinctly made out and supposed to be due to a mediastinal tumor. The autopsy revealed a gelatinous, œdematous deposit in the mediastinum, corresponding to the dulness observed in life. In the case of the syphilitic the same phenomena were observed, the *dulness disappearing under the administration of iodide of potassium.* A year later the same observation was made, and, the patient having died, an autopsy revealed a circumscribed gelatinous œdema.

Œdema of the uvula and soft palate is seen in diphtheria, nephritis, etc., also in circumtonsillar abscess. It is extremely annoying. Patients afflicted with it complain of gagging, coughing, and pain.

TREATMENT.—Ice to swallow or an ice poultice (ice and sawdust around the neck). Scarification of the uvula is proper in the absence of a septic process in the nasopharynx, or the application of adrenalin chloride solution.

Œdema of the larynx, œdema of the glottis, is observed in measles, scarlatina, diphtheria, and retropharyngeal abscess in children and in adults afflicted with tuberculosis or phlegmonous inflammation of the floor of the mouth or neck. In nephritis œdema of the glottis is usually non-inflammatory. Noisy and stridulous breathing, cyanosis, and great fear of suffocation are the symptoms.

TREATMENT.—Ice should be given by the mouth and an ice poultice placed around the neck, and antitoxine must be administered when it is indicated. In urgent laryngeal stenosis intubation or tracheotomy is indicated. Scarification of the epiglottis with a curved bistoury sometimes gives relief, also painting with adrenalin chloride solution. Emetics are useless and dangerous in cases with weak heart. Deep seated abscess about the neck requires prompt surgical aid.

Œdema of the Foreskin.—The inflammatory variety requires cleansing of the parts, scarifications, and moist mild antiseptic dressing. Any constriction present must be overcome.

Malignant œdema of anthrax and other infections is a septic inflammatory œdema due to a specific infection which culminates in the anthrax pustule. In tissue so affected tension must be relieved by a free incision to avoid necrosis of the parts.

Œdema from bites of insects (bees, etc.) is a toxic inflammatory œdema which assumes formidable proportions when it occurs about the face or neck. It usually subsides in a few hours if cold lead lotion is applied. In very bad cases, however, scarification and incision to relieve tension will be required.

Conjunctival œdema (chemosis) and the œdema of trichiniasis are undoubtedly of inflammatory origin.

A localized visible collateral œdema frequently points to an underlying inflammatory focus. *Œdema of the thorax* may accompany *empyema. Œdema of the right hypochondrium* is found in *hepatic abscess.*

ESSENTIAL, OR TOXIC, DROPSY; DROPSY WITHOUT ALBUMINURIA; ŒDEMA OF THE NEW-BORN; MYXŒDEMA

Cases of general anasarca are occasionally met with, chiefly in children, following scarlatina, but sometimes also in adults, which exactly resemble cases of Bright's disease, although there is no albumin discoverable in the urine and no abnormal condition of the heart to account for the condition. These have been called cases of *essential, or idiopathic, dropsy.* The disease has met with little recognition in the general textbooks. This form resembles renal dropsy, and there may be hydrothorax, ascites, and vomiting. The mortality varies from 15 to 30 per cent. Recovery takes place after about six weeks. It is not known whether we have to deal with anæmia, nephritis, or intestinal putrefaction and toxæmia.

TREATMENT.—Milk diet, syrup of iodide of iron, digitalis (infusion or fluid extract), and intestinal irrigation.

Œdema of the New-Born.—In congenital œdema, often of unknown origin, a weak circulation is a factor as well as a symptom. When the entire body is affected, the child's respiration is impaired, the pulse is slow, the temperature is subnormal, and the patient becomes drowsy and dies. The prognosis in general œdema is unfavorable, in partial œdema fair.

TREATMENT.—The warm water bag, an enema, and camphor subcutaneously as a stimulant. Attention to the underlying cause (syphilis) and proper diet.

Myxœdema.—The body appears generally swollen or œdematous, but the swelling is firm and inelastic and does not pit on pressure, as in other forms of œdema. The skin is dry and rough, the facial expression peculiar and stolid. The patients become irritable and suspicious, sometimes demented and comatose. This condition has some obscure connection with the thyreoid gland, which usually becomes shrivelled and loses its glandular structure. Myxœdema frequently results from removal of the thyreoid gland. Many cures of this peculiar malady have been observed after the administration of the thyreoid extract or powder in five or ten grain doses three times a day. This preparation may be given for a long time with occasional intermissions (see also Diseases of the Ductless Glands).

UNILATERAL ŒDEMA FROM THROMBOSIS AND PRESSURE

Œdema of the foreskin by constriction results in *paraphimosis.* As soon as the constriction is overcome mechanically the œdema subsides. If not, scarification and the application of cold lead lotion are indicated.

Venous thrombosis and œdema are of common occurrence after confinement (*milk leg*), in typhoid fever, in other exhausting diseases, or from any form of *pressure.* The thrombosed vein can be felt, and the tissues around it are sometimes red and tender to the touch. A limb in this condition must have rest and should be elevated. It may be bandaged, but not tightly. Ultimately, mild general massage will aid Nature in reestablishing a circulation.

Œdema following fracture subsides as soon as the parts are placed and kept in a normal natural position and the limb elevated.

Angeioneurotic cutaneous œdema may be of a simple variety or associated with urticaria, erythema nodosum, herpes, or febrile purpura. The onset is sudden and may be accompanied by colic, vomiting, and nervous irritability. It is looked upon as a vasomotor neurosis. It is a local swelling, limited in extent and duration. It occurs more frequently in females than in males, and principally in neurotic individuals and also in women who have had their ovaries removed. It has been observed in individuals afflicted with chronic malaria or the rheumatic diathesis. It may appear in any part of the body.

TREATMENT.—Some cases do not respond to any form of treatment; in others prompt improvement follows the administration of bromide of potassium, arsenic, quinine, or sodium salicylate. The patient is well between the attacks.

ENCYSTED DROPSY; RETENTION CYSTS; SEROUS CYSTS

Hydronephrosis

Hydronephrosis is a retention cyst of the kidney due to obstruction of the ureter from various causes (by kinking, cicatricial bands, or calculi). It is usually unilateral and may be congenital. It occurs in both children and adults.

SYMPTOMS.—It may exist without attracting attention, or present a progressively enlarging tumor with dragging pain and pressure symptoms. It may be continuous or intermittent, and may be associated with movable kidney. It may be mistaken for *pyonephrosis*, *kidney tumor*, or an *ovarian*, *omental*, or *hydatid cyst*.

Pyonephrosis gives constitutional symptoms. A bimanual vaginal examination will show the presence of an *ovarian cyst*. A puncture examination of the fluid will clear up the nature of cysts in some cases, and an exploratory incision may be finally necessary to make a diagnosis.

PROGNOSIS.—Some cases give no trouble; others are cured by spontaneous rupture, and some will require surgical interference. Infection may change hydronephrosis into pyonephrosis.

Dropsy of the Gall Bladder

Dropsy of the gall bladder is usually the result of impacted stone in the cystic duct. In recent obstruction the gall bladder contains bile, mucus, or pus. In long standing obstruction the liquid is often clear, thin, or mucous. A distended gall bladder can usually be felt below the costal margin as an elastic, rounded tumor which moves with respiration. In obstruction of the cystic duct alone jaundice is not present. Gallstone crepitus may occasionally be elicited. It requires discrimination from *movable kidney*, *carcinoma of the gall bladder*, and *empyema of the gall bladder*.

Puncture of the gall bladder should not be done unless the physician is ready to go on with radical treatment and to operate at once, as there is danger of leakage from the opening into the abdominal cavity.

Hydrosalpinx

When the fimbriated extremity of the Fallopian tube becomes obstructed from gonorrhœal or other inflammation, hydrosalpinx may result. This condition is recognized when the abdomen is opened for exploratory purposes or operative interference in tubal disease, which is made out by palpation and symptoms.

Hydrocele

Definition.—An accumulation of serum in the *tunica vaginalis* of the *testicle* or *spermatic cord* (*hydrocele of the cord*). This condition may be congenital or acquired. A hydrocele presents a smooth swelling, usually of ovoid shape, and translucent when tested with a roll of paper. Old hydroceles are sometimes not translucent. It gives no pain as a rule, and there is no impulse on coughing.

Differential Diagnosis.—Hernias, hæmatoceles, and tumors of the testicles are not translucent. In hernia the swelling extends through the abdominal ring. An irreducible hernia associated with hydrocele shows an impulse on coughing. Old hydroceles and chronic orchitis with hydrocele require careful exploration. Encysted hydrocele of the cord gives a sausage-shaped, translucent, fluctuating swelling.

Treatment.—Small cysts require no attention. Congenital hydrocele tends to spontaneous cure and does not require immediate attention. Tapping is performed with a boiled trocar and cannula after the parts and operator's hands are thoroughly disinfected. The puncture is covered with dry lint. Repeated tappings may become necessary, as hydrocele manifests a tendency to recur.

Cure by Tapping and Injection.—After tapping, the needle remains in place, and twenty drops of carbolic acid in half a drachm of pure glycerin are injected into the sac; or tincture of iodine and water (āā, ʒss.) are injected and manipulated so as to bring the liquid into contact with every part of the interior, and it is then allowed to flow out. A *radical operation* involves incision and removal of a part of the sac and drainage under antiseptic dressing.

Serous Cysts

These occur in the *kidney*, *ovaries*, *broad ligaments*, *mesentery*, *pancreas*, etc., or in the form of *spina bifida, or meningocele, cysts of the cord* (*hydromyelus ex vacuo*), and *cysts in the brain*. *Hygroma is a cyst* under the skin.

A *serous abscess* is a traumatic accumulation of serum. When accessible, serous cysts present as fluctuating tumors. An examination of the puncture fluid will often help in the diagnosis of cysts. They may require incision and drainage or excision.

The most important are **ovarian cysts,** which are often of malignant nature. They are made out by bimanual palpation. Tapping should not be performed unless one is ready to operate. Ovarian cysts may be mistaken for ascites, pregnancy, or a solid tumor. The *treatment* is operative.

Hydatid Cysts

are formed by the larvæ of *Tænia echinococcus.* They are found in any tissue, but most frequently in the liver, also in the brain, kidneys, lungs, and pleura. The so called "hydatid thrill" may be elicited by placing three fingers over the fluctuating mass and percussing strongly upon the middle finger. The aspirated fluid is like water, of low specific gravity (1,006 to 1,010), and contains sodium chloride and succinic acid. Shreds of the cyst wall, hooklets, and scolices may be detected with the microscope. The symptoms will vary with the region involved. If treatment is called for, it is surgical.

Dropsy of the Amnion (Hydramnios)

may be acute or chronic. The distinguishing features are great distention of the abdomen with increased mobility of the fœtus. In acute hydramnios there are said to be pain, fever, rapid pulse, and dyspnœa. Puncture of the membranes may be necessary in such cases.

The chronic variety may be mistaken for ascites, ovarian cysts, or multiple pregnancy. It begins about the third or fourth month, and gives little trouble. Women so encumbered should wear an abdominal supporter. As post partum hæmorrhage is an occasional complication, the necessary precautions should be taken.

Œdema Bullosum of the Urinary Bladder

On circumscribed portions of the bladder mucosa the cystoscope has revealed clear vesicles of various sizes in connection with symptoms of dysuria, usually as an accompaniment of various local inflammatory conditions within the pelvis.

Dropsy of Joints (Hydrarthros); Dropsy of Bursæ

This is a serous effusion into a joint with a tendency to chronicity. It follows irritation from detached cartilages or joint injury, and occasionally it is intermittent. It is observed in the knee, elbow, wrist, ankle, shoulder, hip, etc., and is distinguished from articular rheumatism by the absence of fever and of acute pain. It is usually overcome by applying friction, massage, and blisters, or the continuous elastic bandage. If such measures fail, aspiration and drainage are indicated.

Dropsy of Tendons; Tendon Cysts; Simple Ganglion

Definition.—An accumulation of fluid in a tendinous sheath.

Treatment.—Forcible rupture by a blow or pressure or aseptic puncture, evacuation, antiseptic dressing, and pressure.

A *compound ganglion* is a chronic tuberculous process. The cyst contains "*rice bodies*" and should be excised if it gives trouble.

RÉSUMÉ OF DIAGNOSTIC PUNCTURES

Technique.—Punctures are made with a small or large exploring needle and syringe. The best syringes are those of glass. The needle must be boiled. The skin to be punctured must be scrubbed with green soap and water and washed with an antiseptic solution and alcohol. The hands of the operator must be clean. Local anæsthesia is secured by injecting a few drops of a 4 per cent cocaine solution or by means of the chloride of ethyl spray. The puncture wound must be covered with sterilized gauze or sealed with collodion.

Points of Puncture

Pleural Cavity.—The seventh or eighth interspace below the scapula or wherever the percussion dulness is most marked and vocal fremitus is absent, or where an intercostal space bulges on deep inspiration.

Peritoneal Cavity.—Be certain of an empty bladder, and puncture in the linea alba below the umbilicus or lateral aspect of the abdomen over the area of dulness.

Pericardial Cavity.—The fourth or fifth interspace, half an inch to an inch to the left of the sternal margin, or in the left costoxiphoid angle, passing the needle upward and backward.

Lumbar Punctures.—Between the third and fourth or fourth and fifth lumbar vertebræ.

Liver Puncture.—The seventh interspace in the midaxillary line, or posteriorly or anteriorly directly into the liver dulness.

Spleen Puncture.—In an intercostal interspace over the area of spleen dulness.

Cranium Puncture.—Through the large fontanelle some distance from the middle line, in order to avoid the superior longitudinal sinus, or anywhere through an opening in the skull made by the trephine.

Cyst and Abscess Puncture.—At the prominent point or in the centre of dulness.

Examination of puncture fluids must be carefully done in the laboratory. The following are some of the *gross characteristics of puncture fluids:*

Dropsical fluids, or *transudates*, cannot always be readily distinguished from *inflammatory fluids*, or *exudates*. Both are serous, clear, and of a light yellow or greenish color, and both contain albumin. If the specific gravity is under 1.015, and the percentage of albumin less than 2.5, it speaks in favor of transudates.

Bloody pleuritic exudates are frequently due either to tuberculous or to carcinomatous disease of the lungs or pleura.

Seropurulent, *putrid*, and *purulent fluids* are of inflammatory origin.

Chylous fluids are found in the abdomen, rarely in the thorax, in connection with a parasitic invasion of *filiaria*, or in cancerous or fatty degeneration of glands and endothelial cells, or from rupture of the ductus lymphaticus. Chylous ascites occurring in patients on a strict milk diet may be due to the excess of fat in the blood (lipæmia).

The *cerebrospinal fluid*, when cloudy, speaks in favor of meningitis. In injury to the spine the fluid may be bloody. Pure pus is sometimes found.

Pancreatic cyst fluid presents no noteworthy gross difference from any other. It may be tested for its power of digesting egg albumin (biuret reaction, see Laboratory).

Hydatid cyst fluid is colorless and clear. Hooklets, scolices, sodium chloride, and succinic acid may be found.

Distended gall bladder fluid may be viscid or colorless or contain bile.

Hydronephrosis fluid is watery, usually contains urea, and many show renal epithelia.

Ovarian cyst fluid varies in color and consistence. It may be watery, viscous, or colloid and greenish or brownish in color. It is said to contain metalbumin.

Cytodiagnosis.—For the cell diagnosis of puncture fluids, see Clinical Laboratory Methods (p. 52).

CHAPTER XV

THE RESPIRATORY SYSTEM

THE UPPER RESPIRATORY TRACT

Synopsis: Remarks on the Clinical Pathology of Respiration.—Methods Employed in Examining the Respiratory Organs.—Rhinological and Laryngological Memoranda.—Catching Cold.—Nasal Obstruction.—Pharyngitis.—Laryngitis.—Simple Erosions and Ulcers.—Syphilis of the Nose, Pharynx, and Larynx.—Tuberculosis of the Nose, Pharynx, and Larynx.—Benign and Malignant New Growths.—Foreign Bodies in the Upper Respiratory Tract.—Hæmorrhage from the Upper Respiratory Tract.—Nasal Deformities, Septum Deviation, Enlargement of Turbinated Bodies.—Disease of the Accessory Sinuses.—Diseases of the Tonsil and Lingual Tonsil.—Circumtonsillar Abscess.—Respiratory Obstruction.—Neuroses and Paralyses of the Upper Respiratory Tract.—Hay Fever.—Formulæ for Office Treatment.

REMARKS ON CLINICAL PATHOLOGY OF THE RESPIRATORY TRACT

The life of the cells and of the organism depends upon the absorption of oxygen and elimination of carbonic dioxide. This gas exchange we may call in a broad sense respiration. External respiration takes place in the lung, internal respiration takes place in the various other tissues. As a prime condition of life, pure air must have free access to the lung, and Nature attempts to expel foreign elements in the respiratory tract by the coughing effort and by means of a centrifugal propulsive power of the ciliated epithelia of the trachea and bronchi.

The natural secretion of the mucous lining of the respiratory tract also aids in the expelling process, as do the sense of smell and the act of sneezing and coughing. Any marked disturbance of this complicated mechanism will favor infection or inflammation, be it localized in the nasopharynx, larynx, trachea, bronchi, or lungs and pleura.

Cough is a reflex phenomenon transmitted through the vagus nerve. The act of coughing is composed of a deep inspiration and an expulsive expiration, with a momentarily closed glottis. The rush of air is due to the high pressure in the lung during the act of coughing.

The centre for the act of coughing is located in the medulla near the centre of respiration. It is not known whether or not cough can be incited by direct cerebral irritation, but the impulse to cough is increased or diminished by various pathological conditions of the respiratory tract itself and changes in the sensory as well as the motor respiratory apparatus *modify the power to cough* (weak cough in muscular inertia). A weak cough in young infants and feeble, aged people allows of undue accumulation of secretion in the lungs, with great danger to life. Inactivity of the respiratory functions, as well as inactivity of the gastrointestinal tract, means stagnation and danger.

Abnormal irritation with undue and fruitless cough is also a danger, harassing the patient, destroying the elasticity of lung tissue (emphysema), and producing undue arterial pressure.

The normal oxidation process in the lungs is interfered with whenever there is *obstruction* in the *nose* or *windpipe.* Nasal obstruction means mouth breathing with its sequelæ. Nasal obstruction in young infants interferes with the sucking power and with nutrition.

Respiratory obstruction in the *larynx* and *trachea*, of whatsoever nature, is of grave importance, be it acute (pseudocroup, spasmus glottidis, attacks of whooping cough) or of a more chronic nature (tumors, membranes, compression from without, etc.). Under such conditions, the blood becomes overcharged with CO_2 and respiratory disturbances take place owing to the active play of respiratory muscles against atmospheric pressure, an inspiratory depression in the epigastric, jugular, and other regions is induced, inspiration and expiration are prolonged, and there is *noisy respiration* as a phenomena of such conditions. When the obstruction is due to paralysis of the postici muscles (openers of the glottis), inspiration is difficult and expiration is free. In unilateral bronchial obstruction, as in membranous croup, auscultation shows diminished respiratory murmur on the affected side. The subjective distress is greater in acute obstruction than in that of slow onset.

As a type of general respiratory obstruction we may mention bronchial asthma, also hay fever. The pathology of the asthmatic attack has not, however, been cleared up, notwithstanding the vast amount of study as to its nature. Nerve degeneration or paralysis is frequently the cause of immobility of the thorax and lung. Abnormal respiratory phenomena frequently take their origin in the respiratory centre in the bulb (Cheyne-Stokes respiration) and may be due to autointoxication (uræmia, diabetes) or to foreign intoxication (hydrocyanic acid) or to reflex irritation (asthma dyspepticum et uterinum).

Respiration is also interfered with in consequence of inflammatory changes in the lungs or accumulations of fluid in the air cells and in the thoracic cavity (hydropyopneumothorax, atelectasis of the lungs, tumors). Abnormal chemical and physical conditions of the lung epithelia and variations in atmospheric conditions, such as *diminished* or *increased* air pressure, have a marked influence on breathing and tissue oxidation (mountain sickness).

Variations of atmospheric pressure influence tissue oxidation by means of a self-regulating process through the agency of the oxyhæmoglobin of the blood. Thus blood pressure, quality of blood, and the degree of its circulation are all of great importance for respiration.

Tissue respiration, or *internal respiration*, is the exchange of gases between the blood and the tissues. In anæmic persons the oxygen of the blood is diminished; thus, we notice a marked dyspnœa on exertion. A primary disturbance of internal, or cell, respiration may take place in consequence of changes in the parenchyma of cells or owing to toxic substances being contained in the circulating fluids (carbonic acid gas, phosphorus, hydrocyanic acid); moreover, the medulla is extremely sensitive to faulty metabolism (suboxidation or toxæmia).

Respiratory disturbance is accompanied by a disagreeable sensation called *dyspnœa* and an indefinite vague sensation of pain which is difficult to localize clinically. Sufferers from chronic dyspnœa eventually reach a certain stage or degree of tolerance, particularly during muscular rest.

The respiratory tract is the portal of entrance for many infectious diseases, and all abnormal conditions of its lining favor infection. For methods of prophylaxis, see the chapter on *Nasopharyngeal Toilet.*

Aside from local causes, hyperæmia of the upper air passages may result from abuse of alcohol and tobacco, cardiac, renal, hepatic, or pulmonary disease, pressure of a goitre or mediastinal tumor, gastroenteric disease pleuritic exudates, tympanites, constipation, constitutional disease, and chronic infections.

Nose and throat symptoms in anæmic, chlorotic, and neurasthenic subjects are seldom remedied by local treatment alone.

To sum up from a clinical standpoint, we find that, apart from *malformations* and *injuries*, the various disturbances of the respiratory organs take their origin in transitory *congestive conditions*, in *infection*, and in *inflammation.* We encounter *obstructive phenomena* due to *foreign bodies, swellings, tumors*, and *parasites*, and we frequently encounter *hæmorrhage* and *neurotic affections.*

RHINOLOGICAL AND LARYNGOLOGICAL MEMORANDA

EXAMINATION OF THE UPPER RESPIRATORY TRACT

To illuminate the cavities to be examined, sunlight or artificial light is reflected by means of a head mirror. Phillips's electric headlight is convenient and can be worked by the street current and current controller. A very convenient and portable source of light is a condenser with a reflector attached (McKenzie light). The source of light should be to the right of the patient, a trifle higher than the mouth. In examining the mouth and pharynx the patient's tongue is depressed with a glass spatula or a spoon handle.

In examining the larynx and trachea the patient's tongue is held with the left hand and the light is thrown upon a warmed laryngeal mirror. The distance from the laryngeal mirror to the vocal cords is about two inches and a half. The posterior aspect of the soft palate or vomer must not be overlooked, as it is occasionally the site of ulcer, etc. To secure relaxation of the soft palate, the patient must breathe quickly through the nose or make a nasal sound. Anterior rhinoscopy is practised by means of a hollow speculum.

In order to allay sensibility and subdue obstructing erectile tissue in the nose which interferes with the vision, we apply a mixture of equal parts of cocaine solution, 10 per cent, and suprarenal solution, by means of a cotton carrier. In order to avoid constitutional effects, the solution should be used carefully and sparingly.

Gargling with potassium bromide solution (5 per cent) or spraying sparingly with cocaine solution (2 per cent) will subdue intolerance and irritability. For examining the nasopharynx, a palate hook is a convenient accessory. A digital examination is readily made in children with the index finger, nail side up. The epiglottis in children can readily be seen by depressing the tongue, and by means of an epiglottis lifter the larynx may be rendered visible.

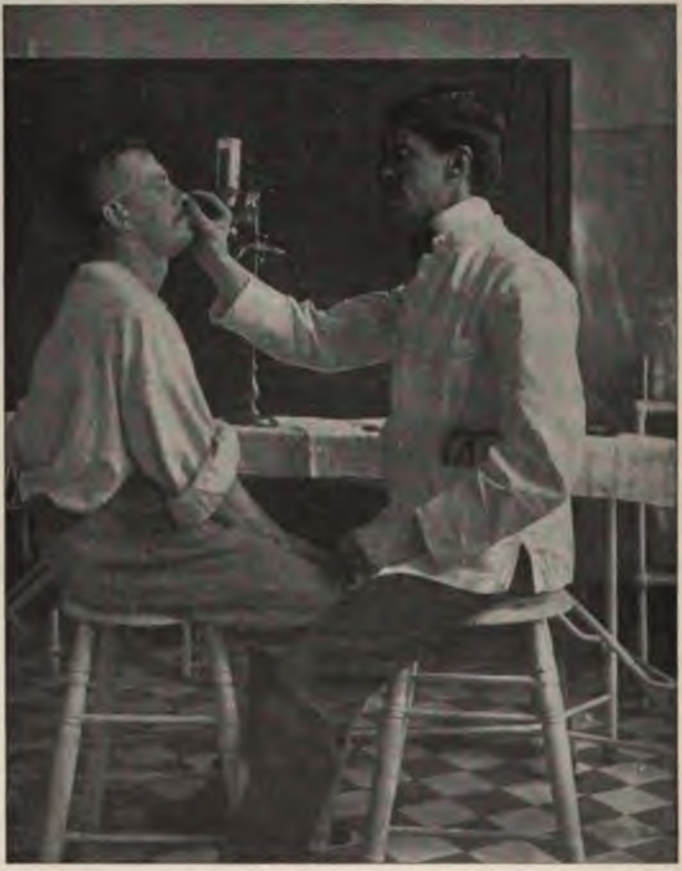

Fig. 128.—Examination of the Anterior Nose by Means of a Nasal Speculum and Reflected Light.

The light should be on the right side of patient.

In difficult or obscure cases an examination by means of *transillumination and Röntgen rays* is indicated.

Autoscopy and Tracheoscopy

In tracheoscopy the patient is examined with the head erect and high. In favorable cases the trachea and bifurcation and several rings of the bronchi can be seen.

In examining the upper air passages one should bear in mind that congestive conditions are not only due to local lesions or disturbances, but are frequently associated with *constitutional troubles* or obstruction to the circulation in regions far from the respiratory organs, therefore local treatment has its limitations.

An examination of the deep respiratory organs embraces the various methods of physical diagnosis. The recognition of fluid within the chest is best accomplished by puncture. Exploratory incisions will probably be done in this region in the future by means of Sauerbruch's apparatus, under suction. The fluoroscope and x ray prints also aid us in diagnosis.

Catching Cold

A "cold" is an everyday occurrence concerning which a satisfactory explanation has not as yet been advanced. Areas of minor resistance or irregularities of capillary circulation are inherent or brought on in various individuals. If cold feet produce catarrh of the upper air passages, or hair cutting an angina or amygdalitis, the irritation is reflected or transmitted to the area of minor resistance, and the resulting local hyperæmia favors infection or the invasion of such microbes as happen to be present, though latent. It is a well known fact that the mouth and upper air passages harbor microbes at all times, and chilling of the body destroys the antibodies in the blood and favors infection. In this manner we probably contract "colds" of the upper air passages.

Breathing cold air is not of itself a source of danger. Nansen, the Arctic explorer, reports the absence of "colds" among his officers and crew while in the ice region, whereas almost all contracted "colds" upon their return to civilization. The writer and a number of his friends have been exposed to cold and damp weather for weeks on moose hunting expeditions in Canada without contracting cold, whereas two days after the landing of the party in the dusty, hot streets of New York City in September almost all had contracted the ordinary nasopharyngeal catarrh, or "cold."

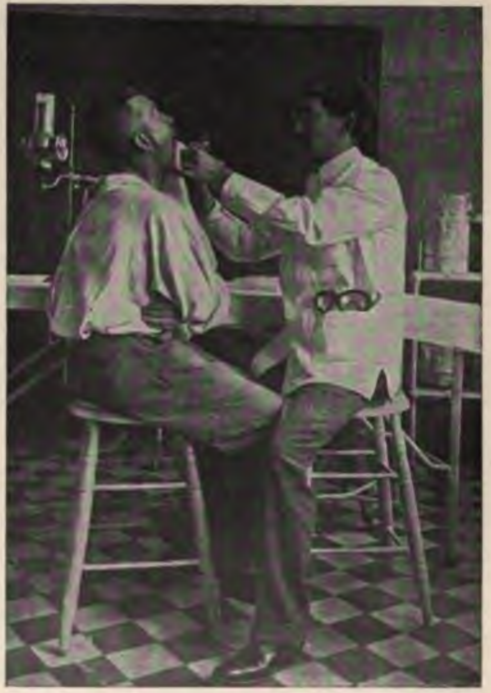

FIG. 129.—LARYNGOSCOPY AND POSTERIOR RHINOSCOPY.

The light should be on the right side of patient.

On the other hand, lumbermen in the North and Northwest, who spend the night in an overcrowded and overheated lumber camp, and farmers, who spend most of the winter in overheated and ill ventilated rooms, are very apt to suffer from all kinds of infectious respiratory ailments. And similar "house infections" are in evidence in the cities, in barracks, in school rooms, and in overheated and carpeted and cushioned living apartments among the rich and poor alike.

It is at all times difficult and frequently impossible to escape infection of some kind or other, but the time is ripe for abandoning the superstition and ignorance which invite infection by fostering and perpetuating the *fear of breathing cold air*. The usual precautions against "catching cold" need not be neglected.

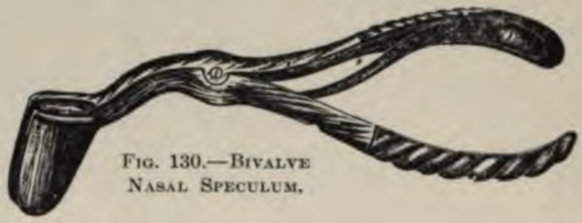
FIG. 130.—BIVALVE NASAL SPECULUM.

The predisposing causes to "colds" anywhere are breathing foul air (in crowded places of amusement, churches, and overheated apartments), breathing of dust laden air, cold feet, and exposure to draughts when sitting still.

Anæmic, *undernourished*, *overworked*, and *worried* individuals and those *afflicted with chronic ailments are predisposed*, for in many chronic ailments the mucous membranes have lost their integrity and are prone to admit infectious material into the system. A cold, according to its localization, is called rhinitis, pharyngitis, laryngitis, tracheitis, or bronchitis.

The **symptoms** of "colds" are the general symptoms of infection, such as chilliness, headache, fever, thirst, general aching, and herpes of the mouth and lips, associated with symptoms of local irritation, such as sneezing, running of the nose, pain in swallowing, stiff neck, hoarseness, aphonia, a tickling sensation, cough, and expectoration.

Prophylaxis.—Persons liable to "colds" should wear thin underwear (cotton or linen) all the year round and keep warm in cold weather by wearing *thick stockings and heavy outer garments*. Daily cold sponge baths are advisable, and a free movement of the bowels should take place once a day. The nasopharynx should be free and clean. The sleeping room should be cold, with the windows open at the top.

Treatment of "Colds" in Adults.—The best way to "break up a cold" is to go to bed after taking a hot soda foot bath and clearing the intestines by a brisk cathartic:

℞	Podophyllin,	gr. ⅓;
	Calomel, Quinine, } āā,	gr. viij;
	Pulv. aromatic.,	gr. ij.
M.		

During the day cold water may be taken ad libitum to promote diaphoresis. The second night a dose of Dover's powder may be taken to induce sweating. A warm bath may be taken at any time, and a liquid or fever diet is indicated. A few drops of dilute hydrochloric acid after eating will aid digestion and hasten convalescence. As soon as the fever has abated, the patient may leave his bed and exercise moderately out of doors.

In acute *rhinitis* the nasal mucosa may be so swollen as to interfere with breathing, and considerable relief may be obtained by applying vaseline to the nose internally and externally. (See also Office Formulæ.)

In acute *pharyngitis* salt water is to be dropped into each nostril and used as a gargle every three hours, and a cold compress may be worn around the neck over night.

In acute *catarrhal laryngitis* the constitutional symptoms are mild. Examination shows a reddened and swollen laryngeal mucosa and pinkish vocal cords. In subacute cases lasting more than a few days the entrance to the larynx may be mildly cauterized by means of a cotton carrier dipped in 2 per cent nitrate of silver solution. Inhalations of all kinds of mild antiseptic liquids are used and probably do no harm. A dose of codeine or heroin at night will allay harassing cough in adults. Five to ten grains of Dover's powder will induce diaphoresis. In extreme cases, with attacks of suffocation and cyanotic skin, *œdema of the glottis or membranous obstruction may be suspected.* In acute *tracheal catarrh* there is pain behind the sternum. The treatment is the same as for acute catarrh of any other division of the upper respiratory tract.

Perichondritis laryngis is seldom primary (infectious or traumatic), but generally secondary to syphilis, tuberculosis, or cancer. Although pain, hoarseness, cough, dyspnœa, and fever may be present, the diagnosis becomes certain when an abscess forms and breaks or is opened and necrotic cartilage is felt by probing.

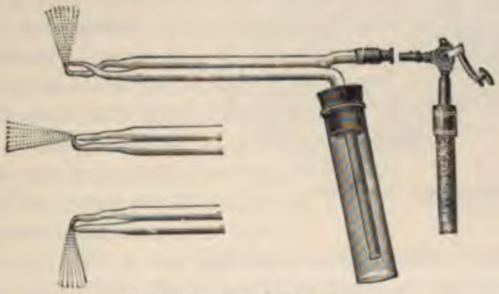

FIG. 131.—SPRAY TUBES.

In the way of *treatment* we may apply ice or leeches in the early stage and open the abscess as soon as it presents. Tracheotomy may be necessary in acute and chronic stenosis, with subsequent intubation and dilating by means of bougies.

NASAL OBSTRUCTION

Chronic nasal catarrh means nasal obstruction or syphilis. With the advent of the nose and throat specialist the term "chronic catarrh" has disappeared, and in its stead we have the various causative factors of catarrh, classified and treated as separate disease conditions. This is undoubtedly more exact as regards the anatomical location of nasal obstruction.

Symptoms.—The general symptoms of nasal obstruction are interference with nasal respiration, a feeling of fulness in the nose, often alternating; mechanical results, such as headache, mouth breathing, a dry tongue, a nasal voice, vertigo, ear trouble, hawking and spitting, a nasal discharge, unilateral or bilateral, and various reflex phenomena.

Causes.—The causes of nasal obstruction and nasal catarrh are hypertrophic rhinitis, atrophic fœtid rhinitis, deviated septum and spurs, enlarged turbinated bones, polyps and tumors, syphilis, tuberculosis, and foreign bodies.

Hypertrophic Rhinitis

Hypertrophic rhinitis may be defined as a swelling of the erectile tissue of the nose. This tissue is found anteriorly on the middle and inferior turbinated bones and on the anterior and upper aspect of the septum. A pathological or undue swelling of this tissue results from circulatory disturbances, from dust breathing, and usually from a stenosis of the nose due to deviations and spurs of the septum which produce rarefaction of air back of the stenosis.

Diagnosis.—Catarrhal symptoms and the fact of shrinkage of erectile tissue under cocaine solution (5 per cent) applied by means of cotton on a probe establish the diagnosis.

Treatment.—In addition to general hygienic management, frequent cleansing and lubricating the nose by means of salt water, Seiler's tablets in solution, and the benzoinated albolene spray will often give relief. In severe cases operative measures are necessary. After anæsthetizing the parts by means of cocaine (10 per cent solution), cauterization with trichloracetic acid is performed once or twice at an interval of eight days, and superabundant tissue may be removed with the Jarvis cold snare. (For nasal obstruction due to adenoids or enlarged tonsils, see Pædiatrics.)

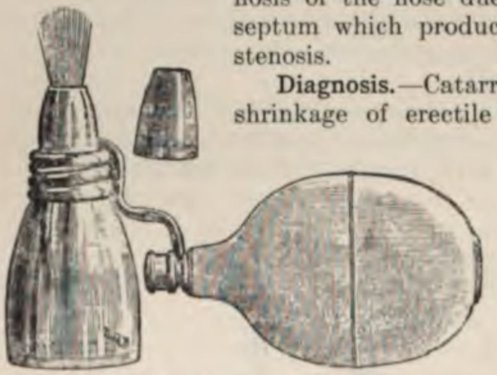

Fig 132.—Albolene Atomizer.

Chronic Pharyngitis

Chronic pharyngitis may be ***hypertrophic***, ***follicular***, ***granular***, or ***atrophic***, and is usually a part of a chronic nasal obstruction observed in drinkers, smokers, and persons exposed to dust. The throat is duskily hyperæmic or studded with a number of projecting rounded bodies (enlarged mucous follicles) or shows a raw granulation tissue sometimes extending laterally downward. Occasionally the mucous membrane is dry and glistening *(atrophic* form).

Symptoms.—Dryness, hawking, and spitting of a tenacious secretion, the sensation of a foreign body, easily fatigued voice, a tendency to ear trouble, pain, and other nervous symptoms.

Treatment.—(*Hypertrophic form*): General hygiene, avoidance of dust and smoking, keeping the bowels open, nasopharyngeal toilet with salt water, Dobell's solution, borax and glycerine, or albolene spray. Granulations are to be cauterized with 5 to 10 per cent nitrate of silver solution several times a week by means of a bent cotton carrier, which may also be inserted upward behind the uvula and soft palate. Curettage of the nasopharynx may become necessary, also the removal of enlarged tonsils or nasal obstruction. In children a chronic pharyngitis is usually due to adenoid vegetations, which require removal by curettage (see Adenoids).

Chronic Laryngitis

In chronic laryngitis we must look for the following conditions: Chronic laryngeal catarrh, atrophic laryngitis, pachydermia laryngis, tuberculous laryngitis, syphilitic laryngitis, and prolapsus ventriculi.

Chronic Laryngeal Catarrh.—The ætiology is the same as in acute catarrh, and the chronic stage may follow acute attacks or the abuse of alcohol and tobacco and public speaking, or result from chronic nasopharyngeal disease. On examination the larynx appears red and swollen and may show granulations and superficial ulcers or erosions.

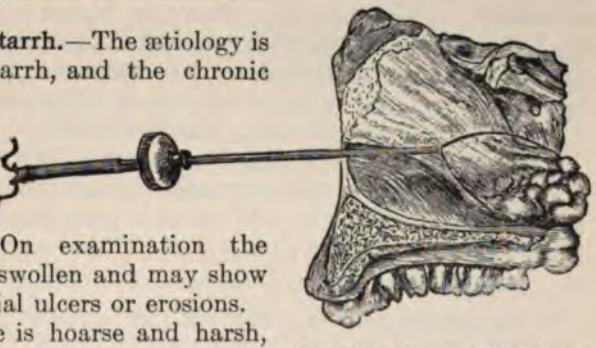

FIG. 133.—SNARING POSTERIOR NASAL HYPERTROPHICS.

SYMPTOMS.—The voice is hoarse and harsh, and there is cough with a thick secretion.

TREATMENT.—Correction of bad habits, rest of the voice, correction of obstruction, benzoinated albolene spray, the nasopharyngeal toilet, vibratory massage of the larynx, and residence in dust free air.

Laryngeal Ankylosis of the Cricoarytænoid Articulation.—The majority of cases are due to perichondritis resulting from syphilis, gout, tuberculosis, typhoid ulceration, diphtheria, or any local inflammation or injury.

SYMPTOMS.—Hoarseness, pain, dysphagia.

DIAGNOSIS.—On examination, the one side of the larynx is found to be immovable. The differential diagnosis between paralysis of the recurrent laryngeal nerve and laryngeal ankylosis rests upon a careful process of exclusion.

TREATMENT.—In chronic cases vocal gymnastics and vibratory massage are to be employed in connection with specific medication when indicated. *Nasal stenosis* is a frequent cause of laryngeal congestion and requires proper treatment when present.

Pachydermia Laryngis.—Hyperplasia and horny metamorphosis of epithelium of the vocal process and interarytænoid space. This condition is associated with *chronic laryngitis* and is treated in the same way.

Prolapsus Ventriculi.—This is a term used to designate a pendulous, tumorlike swelling protruding from the ventricle of Morgagni and hanging down into the glottis. It is a tissue hyperplasia associated with chronic laryngitis and may require endolaryngeal removal.

Atrophic Forms of Rhinitis, Pharyngitis, and Laryngitis

Atrophic Rhinitis (simple and fœtid) may be defined as an infectious destruction of the glandular elements of the mucous membrane.

Symptoms.—Crust formation in the nose, offensive odor, headache, loss of smell, and pharyngeal irritation.

Prognosis.—The offensive odor can be overcome; a radical cure is seldom observed.

Treatment.—In addition to general hygienic management, cleansing with 5 per cent ichthyol spray or listerine in water, 1 to 4, or salt water, to be followed by benzoinated albolene spray. When *syphilis* is the underlying cause, iodide of potassium should be administered per rectum or internally.

In *atrophic pharyngitis* we have the symptoms of chronic pharyngitis. In this ailment caustics are not to be employed, as they generally aggravate the condition. The aqueous solution of borax and glycerine, in spray form, is well adapted for local use. (See Formulary.)

Atrophic catarrhal laryngitis is observed in atrophic disease of the nasopharynx. Owing to crust formation within the larynx, the voice is altered, dyspnœa sets in at night, and cough is present. The treatment is the same as in chronic laryngitis.

EROSIONS AND ULCERS IN THE UPPER RESPIRATORY TRACT

Superficial Simple Ulcers and Erosions are found in the nose, particularly in the anterior region of the septum, and frequently give rise to troublesome *nose bleed*. In the pharynx and larynx they occur in connection with chronic pharyngitis and laryngitis, typhoid fever, and other infections, and in diabetes and other chronic constitutional ailments ulceration is occasionally observed.

The treatment must be in harmony with the underlying cause, and local if the part is accessible. The ulcerated tissue may be stimulated to healthy action by cauterization with a 10 per cent silver nitrate solution, or with the galvanocautery. The *severe forms* of ulceration are due to *syphilis*, *tuberculosis*, or *carcinosis*.

Syphilis of the Nose may be congenital or acquired. Primary chancre is rare. The differential diagnosis from non-syphilitic lesions requires careful search for the various syphilitic manifestations to be found in different parts of the body.

Nasal syphilis is accompanied by chronic catarrh, fœtid odor, necrosis of bone or ulceration of soft tissues, and pain in the nose, eyes, forehead, and deep structures. A softening ulcer appears as a crateriform excavation, frequently on the cartilaginous septum, perforation and collapse of the *septum* resulting. When the bony parts are perforated, syphilis may be diagnosticated without hesitation. The perforation may extend to the mouth, and portions of the hard palate may come away.

TREATMENT.—Syphilitic coryza in children disappears after vigorous antisyphilitic treatment: Calomel (gr. $\frac{1}{10}$ to $\frac{1}{8}$) twice daily and general hygiene. In adults an inunction cure or injection cure or mixed internal treatment is indicated, in addition to general hygiene and disinfecting nasal sprays. Crusts, granulations, and loose bone must be removed in the usual way.

Syphilis of the Pharynx is usually a secondary manifestation and rarely a primary infection. The mucous patches appear about the time of the skin eruption. When an infiltration or gumma breaks down, we observe deep, craterlike ulceration, surrounded by a reddened zone. In the absence of definite symptoms a therapeutic test will decide the question.

TREATMENT.—Specific local cleanliness by means of the nasopharyngeal toilet is valuable in the management of such conditions. In the second stage mixed treatment is to be adopted, and in the third stage potassium iodide should be given. For local treatment we employ the nasopharyngeal toilet and a chlorate of potassium gargle, also cauterization with a 5 per cent nitrate of silver solution. Adhesions between the soft palate and pharynx must be cut with a rectangular knife and kept open.

Syphilis of the Larynx.—About 3 per cent of syphilitic patients are said to acquire laryngeal syphilis in the form of erythema, mucous patches, gummata, and ulcers. Syphilitic ulcers have deep red surroundings and spread more rapidly than tuberculous ulcers, and are apt to end in stenosis, owing to widespread destruction of the parts and cicatrization.

The SYMPTOMS are the same as in tuberculous ulceration, but there is much less discomfort and pain.

The DIAGNOSIS is based upon a history of syphilis and evidence of syphilis in other parts and the described local manifestations. Errors of diagnosis are possible. The writer remembers one case, which was pronounced *tuberculosis of the larynx because tubercle bacilli were found in the sputum, that cleared up entirely under mixed treatment.*

TREATMENT.—Energetic antisyphilitic management, supplemented by mild local measures in the form of oil or alkaline sprays or stimulating inhalations, is indicated. In œdema of the larynx tracheotomy may be necessary.

Tuberculosis of the Nose is seldom primary, but appears as a granulation tumor or ulcer, most frequently on the cartilaginous septum, which may become perforated. Crusts and epistaxis draw attention to the visible lesion. Pain is seldom complained of.

TREATMENT.—Curettage and cauterization with lactic acid or the galvanocautery or radical removal of the diseased cartilage. Tuberculous ulcers in the nose show very little tendency to heal under any form of treatment.

Tuberculous infiltration and Ulcers of the Pharynx have irregular and undefined boundaries with a tendency to lateral extension.

SYMPTOMS.—Severe pain on swallowing, a tenacious discharge, foul breath, hectic fever, and other evidence of tuberculosis (tubercle bacilli in the sputum).

TREATMENT.—General hygienic treatment. Nasopharyngeal toilet, insufflation of iodoform or orthoform, local applications of cocaine, also lactic acid (20 to 30 per cent).

PROGNOSIS.—Few cases are known to be cured. Death may ensue after six to eight months.

Tuberculous Laryngitis.—About 30 per cent of persons afflicted with pulmonary tuberculosis have laryngeal tuberculosis. The primary involvement of the larynx is rare. Examination shows infiltration and ulceration in localized areas. The ulcers are usually multiple with a tendency to coalesce and not to penetrate deeply. Œdema of the larynx is a common complication. Anæmia of the larynx and pharynx is usual.

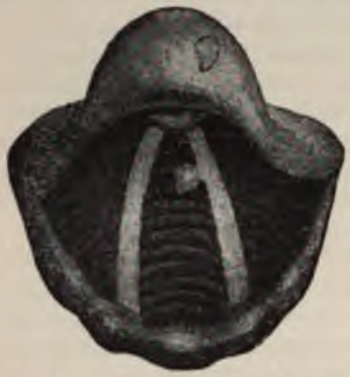

FIG. 134.—FIBROMA OF THE VOCAL CORD (Shurly).

SYMPTOMS.—Hoarseness, aphonia, pain on swallowing, cough, hæmoptysis.

TREATMENT.—In addition to the general hygienic management and rest of the voice, the larynx should be sprayed with an alkaline mixture (Seiler's tablets) or a watery liquid containing menthol, creosote, or cocaine. Insufflations of orthoform and iodoform are to be used. In suitable cases the infiltration may be excised or curetted and the ulcer treated with 25 per cent lactic acid solution applied by means of a cotton carrier. Local treatment, on the whole, is unsatisfactory. Tracheotomy may be necessary in œdema with urgent stenosis.

Carcinomatous Ulcers have been observed in all the mucous membranes. In suspected cases the patient should have the benefit of the doubt and undergo an inunction course for syphilis.

NEW GROWTHS, BENIGN AND MALIGNANT, OF THE UPPER RESPIRATORY TRACT

The **Benign Tumors** are *polyps, papilloma, fibroma, lipoma, chondroma, angeioma,* and *cysts.*

The **Malignant Tumors** are *carcinoma* and *sarcoma.*

New Growths in the Nose

Polyps are soft gelatinous masses, and if located anteriorly they can be seen to move with each breath. Those growing in the posterior nares may be detected by introducing the finger behind and around the soft palate, or they may be engaged in a wire loop introduced through the anterior nares. The *symptoms* are those of unilateral or bilateral obstruction, with "catarrh." *Neoplasms of the pharynx* are not frequent. We observe them on the uvula, palate, tonsils, and other parts of the pharynx. Nasopharyngeal polyps and fibromata may arise from the vomer, the choanæ, and the occipital bone.

TREATMENT.—Polyps are removed by means of a forceps or the wire snare, and if possible under cocaine. The base of the polyp, after removal of the growth, should be cauterized with trichloracetic acid to prevent if possible a return of the trouble, which is very apt to occur. Should bleeding arise, it may be checked by applying ice cold water or strong alum water. The removal of benign new growths other than polyps may be accomplished by means of the cold or hot snare, electrolysis, or the galvanocautery knife.

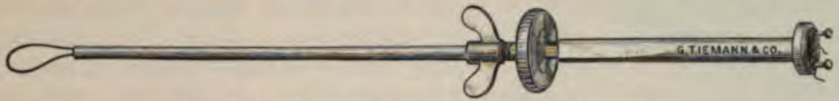

FIG. 135.—JARVIS' SNARE, STRAIGHT OR CURVED.

Benign Tumors of the Larynx and Trachea

The most frequent benign tumor of the larynx is the papilloma, which is found in children and adults. It is often multiple and may be located on the vocal cords or in the subglottic region. The principal symptoms are hoarseness, aphonia, and attacks of dyspnœa. The diagnosis is established by the laryngoscope. The endolaryngeal treatment of papillomata in children is not advisable according to the experience of the writer. Even after splitting the larynx and removing all growths, recurrence is frequent. All other tumors and cysts require surgical or endolaryngeal treatment.

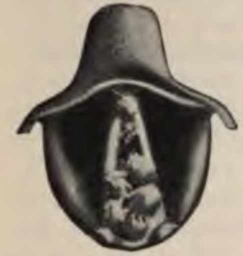

FIG. 136.—CONGENITAL PAPILLOMA OF LARYNX.

Malignant Growths

Those of the *tonsils and soft palate* are slow of growth, with involvement of the lymph nodes. Malignant growths in the *larynx*, sarcoma and carcinoma, give the same symptoms as benign growths in the beginning, but with every malignant ulcerative process we have in addition fœtid breath, bleeding, involvement of lymph nodes, and finally cachexia. To establish the diagnosis it is usually necessary to remove a piece of the swelling for microscopical examination. However, mistakes are made with the microscope also, and when there is an element of doubt regarding the absence or presence of *syphilis*, an inunction course should be instituted. With an early diagnosis radical means may be employed in good time (partial or total extirpation of the larynx) and life may be prolonged for two or three

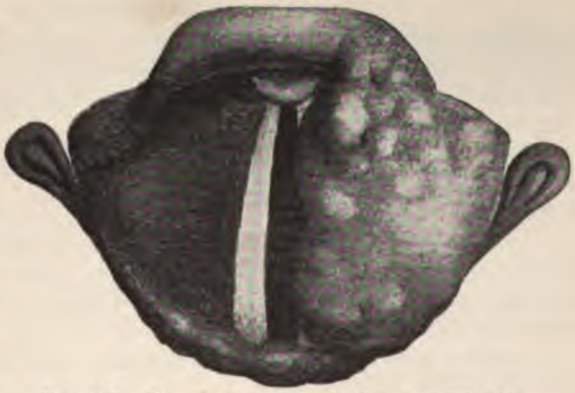

FIG. 137.—EPITHELIOMA OF THE LARYNX (Shurly).

years. The knife alone does not cure cancer, and the near future may give us a better insight into its pathology and better methods of cure.

In *sarcoma*, injections of Coley's erysipelas toxines may be tried. Loeffler has recently suggested the antagonism of malaria and malignant new growths. The x rays and radium are also being employed in the treatment of "inoperable" malignant new growths. In doubtful cases antisyphilitic treatment should be tried before operating or before giving an unfavorable prognosis.

FOREIGN BODIES IN THE UPPER RESPIRATORY TRACT

Foreign Bodies in the Nose.—In addition to *rhinoliths* (*calculi in the nose*), all kinds of foreign bodies have been found in the noses of children and demented persons. One sided suppuration of long duration is suggestive of a foreign body, which may remain impacted for years. The discharge in such cases is fœtid and headache is a prominent symptom.

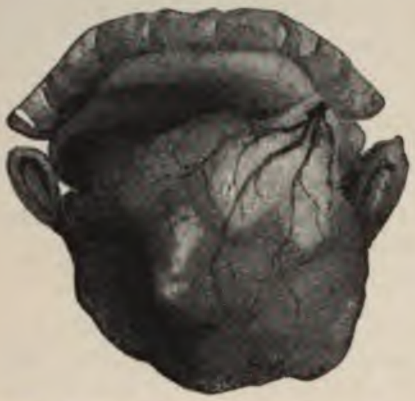

FIG. 138.—SARCOMA OF THE EPIGLOTTIS (Shurly).

TREATMENT.—After cleansing the nose, a strong light may be thrown into the nostril, and a careful search is then made by means of a probe. The removal of a foreign body is accomplished by insufflation on the sound side with a Politzer air bag, or by means of a sharp curette or forceps, if necessary under narcosis.

Foreign Bodies in the Pharynx.—Fishbones and needles may be seen in a good light, but are usually detected by a careful digital examination and removed by means of a suitable forceps. Eating dry bread and swallowing a raw egg helps to dislodge a fishbone. Sometimes the foreign body has been expelled without the patient's knowledge, but no relief is felt, on account of the wound in the mucous membrane.

Foreign Bodies in the Larynx.—The entrance of a foreign body into the larynx is attended with coughing and attacks of suffocation, and unless it is expelled inflammation and ulceration may supervene.

TREATMENT.—When a foreign body is impacted above the vocal cords, it may be extracted with forceps. If it is below the vocal cords, the patient should be inverted, in which position gravity and a coughing spell may force out the foreign body. In case of a foreign body in the trachea, place the patient on a lounge in the abdominal posture, head downward, arms on the floor, and instruct him to take a slow, deep inspiration and follow it with a forcible cough. If this is unsuccessful, tracheotomy should be done, when the foreign body may possibly be reached with forceps. Foreign bodies have been located by means of the bronchoscope.

HÆMORRHAGE FROM THE UPPER RESPIRATORY TRACT (EPISTAXIS)

Hæmorrhage from the nose may be due to traumatism, nasal disease, local erosions from picking with the fingers, racemose veins, or circulatory disturbances (hear disease). Persons with acquired or hereditary hæmophilia or other constitutional diseases (scurvy) are apt to bleed from the nose. The bleeding may be of a *vicarious nature*, as in young girls at the time of menstruation. Syphilitic or tuberculous ulcerations and granulations are prone to bleed. In most instances the bleeding point is found at the anterior cartilaginous part of the septum.

TREATMENT.—The nose should be cleansed and the bleeding point cauterized with the galvanocautery or lunar caustic or some other caustic. Antipyrine in 10 per cent solution, suprarenal solution, or strong alum water is also efficacious. Should the bleeding interfere with the investigation, it is proper to plug the nostril and make a further search later. Anterior tamponade and postnasal tamponade are readily accomplished by means of punk, gauze, or absorbent cotton saturated with strong alum water or tannin and glycerine. The tampons should be removed on the second or third day and the tamponade renewed if necessary. The postnasal tamponade is accomplished by means of Bellocq's cannula or a flexible catheter.

Laryngeal Hæmorrhage.—A traumatic submucous hæmatoma may embarrass respiration to such an extent as to require tracheotomy. Bleeding from the free mucous surface may occur in healthy persons or in persons suffering from a circulatory or constitutional disease. A careful examination is necessary in order to ascertain the source of the hæmorrhage, which usually subsides after the use of ice and suprarenal capsule internally and rest of the voice. Hæmorrhage from the trachea may be due to severe constitutional disease, to erosions and ulcers of tuberculous or syphilitic origin, or to cancer. The treatment must be in harmony with the ætiological factors.

DEFORMITIES

Saddle Back Nose.—Deviations of the septum and spurs and enlargement of the turbinated bodies are frequent causes of nasal obstruction. They may be bony, cartilaginous, or membranous, presenting symptoms almost identical with those of hypertrophic rhinitis.

TREATMENT.—The treatment in such cases is strictly surgical, usually under cocaine (suprarenal) anæsthesia. Soft tissues may be removed by means of the knife or a cutting forceps (punch). Bony tissue may be reduced by means of the hand saw or the electric drill. After septum operations splints are introduced to keep the septum straight until it is healed. Hæmorrhage may be controlled after the operation by introducing a firm pledget of cotton soaked in alum water or suprarenal decoction.

After some operations on the septum we observe a permanent perforation, which, however, is of no special importance.

Saddle back nose, from whatever cause, such as syphilis, traumatism, tuberculosis, infectious abscesses, or lupus, may be corrected by the use of paraffin subcutaneously injected, and by other surgical means. Other deformities require surgical correction.

DISEASE OF THE ACCESSORY SINUSES OF THE NOSE

The *frontal, ethmoidal,* and *maxillary sinuses* are occasionally the seat of suppuration. The predisposing factors are syphilis, dental caries, traumatism, and an extension of acute rhinitis in infectious disease. The principal symptoms are headache, localized pain and sudden discharge, vertigo, and a pressure sensation. The most important symptom is the presence of pus in the nose, and it sometimes flows freely when the head is held in a certain position. Sensitiveness on pressure over a pus area is sometimes elicited, and transillumination by means of a strong electric light held in the mouth may show a dark area of pus.

Treatment.—Frequent cleansing of the nose with warm salt water or any other mild disinfectant is often followed by a cure. The pus in such cases finds a vent through the natural openings into the nose. The maxillary sinus may also be tapped through the alveolar process (second molar or canine fossa).

In ethmoidal disease any obstruction may be removed with the sharp curette or by ablation of the middle turbinated bone. The frontal sinus may be tapped through the bone between the eyebrows.

The after-treatment consists in cleansing irrigations.

Conservative treatment in cases of pus in the maxillary sinus in which a diseased tooth is not an ætiological factor is most desirable. The overgrowth of tissue in the region of the ostium maxillare must be cut away to restore normal drainage. Should improvement fail to follow, the patient should be advised to live at the seashore or in the mountains. If we conclude eventually that the mucous lining of the sinus has undergone degeneration, curetting of its walls through an artificial opening may be indicated.

THE TONSIL IN ADULTS

Simple or Catarrhal Amygdalitis has the same causes as catarrhal pharyngitis and is treated in the same way.

Follicular or Lacunar Amygdalitis is generally an infection of the tonsil accompanied by a punctate exudation which is frequently of diphtheritic character. We are unable to distinguish one variety from the other except by a bacteriological test. Children have frequently contracted fatal diphtheria from adults supposed to be suffering with amygdalitis.

The symptoms of amygdalitis are those of a general infection, fever, chill, headache, rapid pulse, even delirium, local pain and swelling, and indurated lymph nodes.

TREATMENT.—A brisk cathartic, ice to suck, a moist dressing around the neck, gargling with chlorate of potassium (ʒj to ℥viij) or ichthyol, 2 per cent, and the nasopharyngeal toilet. Scarification is permissible in the absence of diphtheria.

Patients afflicted with acute amygdalitis should not mingle with children. In diphtheritic amygdalitis antitoxine is indicated (3,000 units).

Phlegmonous Amygdalitis with Circumtonsillar Abscess

Quinsy Sore Throat.—An infectious inflammation of the tonsil, circumtonsillar tissue, usually one sided, with considerable local œdema and swelling and inability to open the mouth and nasal regurgitation on swallowing, in addition to the general symptoms of infection.

TREATMENT.—The treatment is that of follicular amygdalitis, and an incision into the tonsil or protruding and fluctuating soft palate is generally necessary. The mouth is gradually forced open, and with the aid of a good light the upper part of the tonsil near the edge of the palatine pillar or the palatine arch near the edge of the tonsil is cocainized and incised by plunging in a bistoury to the depth of half an inch. A guard of adhesive plaster wrapped around the knife blade half an inch from its point will prevent accidental injury of deeper parts. One or more incisions may be made, and a dressing forceps or blunt probe may be introduced into the abscess cavity to facilitate the flow of pus.

Scarification and incision will do no harm even if pus is not found, and an abscess may subsequently find its way through the opening thus made. The after-treatment consists in gargling with hot antiseptic fluids.

Tonsillar Concretions are occasionally met with, giving rise to local irritation. They may be detected by probing the crypts and may be removed by means of forceps after slitting open the ducts.

Angina Ludovici (Phlegmon of the Neck).—A septic phlegmonous inflammation of the soft tissues of the neck and floor of the mouth, taking its origin in the buccal cavity or nasopharynx and frequently proving fatal on account of laryngeal œdema and suffocation. In urgent cases tracheotomy is indicated and the usually deep seated abscess must be opened from the outside by a large incision and careful dissection.

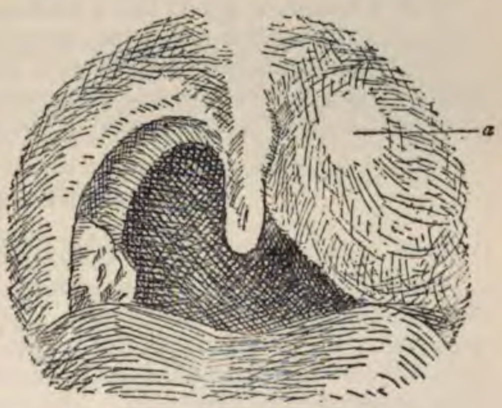

FIG. 139.—PERITONSILLAR ABSCESS.
a, Point for incision.

Hypertrophy of the Tonsils

Faucial tonsil hypertrophy is more frequent in children than in adults.

Symptoms.—Mouth breathing, snoring, nasal voice, etc.

Treatment.—Removal by means of a Tiemann-Fahnenstock or McKenzie amygdalotome. (See Pædiatric Section.)

To prevent subsequent wound infection, the stump may be painted with a 25 per cent solution of chloral hydrate. In case of hæmorrhage following amygdalotomy, the following treatment is to be employed: Gargling with alum water, swallowing ice, clamping and torsion of any bleeding vessel, the galvanocautery, manual and instrumental pressure, and ligation of the carotid.

The Use of the Tonsil Knife and Tonsillar Clipper

Enlarged tonsils adherent to adjacent structures must be made free by means of the tonsil knife before they can be excised or they can be removed piecemeal by means of *Gleitsmann's tonsillar clipper.*

Hypertrophy of the Lingual Tonsil at the base of the tongue is visible by means of the laryngeal mirror. It gives rise to cough, a foreign body sensation, hæmorrhage, and pain.

TREATMENT.—Removal with a snare or amygdalotome of special construction or by caustics. For the Pharyngeal Tonsil, see Adenoids.

Mycosis of the Pharynx and Tonsils

Leptothrix appears in small whitish nodules anywhere in the pharynx or on the tonsils, and seldom gives pronounced symptoms.

The *prognosis* is good, but a prolonged and energetic treatment is required for the eradication of the parasite.

The plaques may be swabbed with tincture of iodine or nitrate of silver solution (10 per cent), or may be removed mechanically with the curette or galvanocautery or by excision of the tonsil.

RESPIRATORY OBSTRUCTION

Œdema of the Larynx or Glottis

Stasis œdema may set in in nephritis, malarial disease, or heart disease, from pressure of a tumor, or from injury. Inflammatory œdema is observed in acute infectious diseases and local inflammations, and particularly in such processes as are localized in or near the larynx, such as diphtheria, deep abscesses, and erysipelas. The onset is much the same as in acute catarrhal laryngitis, with a gradually increasing impediment to respiration resulting in urgent dyspnœa and cyanosis. In the laryngoscopic mirror the epiglottis is seen to be bright red, semitransparent, and large. To the educated finger the epiglottis and the arytænoepiglottic folds appear swollen and boggy.

The **prognosis** depends upon the underlying cause and the adoption of proper means at the right time. If an ice bag, leeches, cathartics, and scarifications fail to give relief, tracheotomy must be done.

Other causes of *respiratory obstruction* are *foreign bodies, hæmorrhage, croup membranes, aneurysm, mediastinal abscess, tumors* and *cysts, goitre* and *enlarged thymus gland, abscess (perichondritis), cicatrices, syphilis, spasm,* and *paralysis.*

A *cheesy gland* may rupture into the trachea and cause sudden death. *Chronic obstruction* may also result from faulty intubation with subsequent cicatricial stenosis of the larynx. Congenital syphilis may give rise to *bronchostenosis in children.*

The principal **symptom** of respiratory obstruction is dyspnœa, and a careful anamnesis and local examination, including examination of the sputum, are necessary to diagnosticate the seat, extent, and cause of the respiratory obstruction.

Bronchostenosis may be suspected when there is impaired mobility followed by shrinking of the affected side. The vocal fremitus is lessened on the affected side, with a marked thrill of the thoracic wall. Percussion becomes less resonant and usually higher pitched over the affected lung, and dulness may be due to secondary atelectasis. Respiration is relatively feeble and vocal resonance is diminished on the affected side. There may be spasmodic cough, pleuritic pain, dyspnœa, and a mucopurulent discharge.

Tracheal Stenosis may result from goître, thoracic aneurysm, mediastinal tumor, new growths, or foreign bodies in the trachea.

We observe long drawn, noisy respiration, slight motion of the trachea, and epigastric retraction. Vocal fremitus is diminished and pulmonary resonance usually clear. The patient complains of substernal pain and soreness or oppression. Dyspnœa is usually expiratory and constant, with exacerbations on exertion or at night and in the recumbent position. Laryngeal stenosis is excluded by visual examination. Cough and expectoration may be present.

TREATMENT is either symptomatic, when the underlying condition is incurable, or specific in syphilitic affections, or surgical. The removal of impacted foreign bodies in a bronchus has been successfully accomplished in rare instances. In "inoperable" malignant new growths a daily exposure to the x rays for ten to fifteen minutes may be tried as a *dernier ressort.*

NEUROSIS AND PARALYSIS OF THE UPPER RESPIRATORY TRACT

Anosuria.—The loss of smell may be due to local disease or disease of the olfactory bulb or tract.

The PROGNOSIS depends upon the underlying cause. It is unfavorable when the sense of smell has been extinct for several years.

TREATMENT.—When anosuria exists because of nasal obstruction, owing to which odorous substances cannot reach the olfactory nerves, the removal of the obstruction is indicated. In central anosuria little can be accomplished other than by hygienic management and antisyphilitic treatment when syphilis is the underlying cause.

Reflex Neuroses.—Many reflex phenomena of nasal origin are observed in consequence of general and local reflex irritability or hyperæsthesia. A careful examination in such cases will reveal some form of nasal obstruction, but occasionally we meet with cases in which supersensitiveness exists in throat obstruction. Some of the reflex symptoms which take their origin in the nose are neuralgia or spasm about the head or face and redness at the tip of the nose (vasomotor disturbance, asthma, etc.).

To determine that the reflex symptom arises from the nose, we try to elicit the reflex by probing or to remove it by cocainizing the nose.

TREATMENT must be directed against the neurotic habit (cold sponge baths) and locally against all palpable lesions.

Vasomotor Rhinitis; Hay Fever; Pollen Fever

So called hay fever coryza, usually beginning in July and August, is distinguished from simple coryza by the incomplete intermissions between the attacks and by the character of the secretion, which is watery and not purulent. In addition, the patient complains of general malaise, sneezing, and asthmatic attacks.

Treatment should begin before the hay fever attack sets in, by correcting any nasal obstruction which may be found. In the beginning of an attack the patient should take a stiff dose of quinine and calomel, and a few drops of a suprarenal solution containing 1 per cent of cocaine may be instilled into each nostril three or four times a day. The benzoinated albolene spray is also to be used and five grains of saccharated suprarenal powder may be taken internally three times a day. A change of climate is frequently beneficial.

Professor Dunbar, of Hamburg, Germany, has succeeded in isolating the pollen poison from various grasses and has invented a hay fever serum (pollantin, Dunbar) which is to be applied locally in connection with the treatment outlined as above. It has given very satisfactory results in all forms of hay fever.

Pollantin Dunbar is obtainable in the shops with full directions for its use.

Neuroses of the Pharynx

Gustatory Neuroses are rare. Loss of the sense of taste has been observed in hysteria, brain tumor, and local inflammations of the tongue and pharynx. Perverted taste is found in pregnancy and hysteria.

The *treatment* is based on the underlying cause.

Sensory Neurosis.—*Hyperæsthesia* is found to be common in smokers and drinkers. It may be relieved by avoiding local irritation and by the internal administration of potassium bromide or the local application of cocaine to facilitate a laryngoscopic examination.

Neuralgia of the Pharynx is rare. *Paræsthesia,* abnormal sensation, is usually due to local causes in hypertrophic papillæ at the base of the tongue in neurotic individuals. A painstaking examination often reveals the cause and indicates the treatment (cauterization and removal of hypertrophic tissue, cold douches, and general hygienic measures).

Motor Neurosis (spasms) are found in hydrophobia and in hysterical individuals.

Paralysis is found in central disease, in diphtheria, and as the result of local causes. The *prognosis* and *treatment* depend upon the underlying cause.

Neuroses of the Larynx

Laryngeal Anæsthesia from central or peripheral causes and as a symptom in hysteria is dangerous because of the absence of all reflexes, so that food and drink pass into the larynx.

Hyperæsthesia is found in neurotics, in pregnant women, and in local inflammatory conditions.

Paræsthesia may have central or peripheral causes.

The treatment of these conditions depends upon the underlying cause, and hydrotherapy is very useful in this class of cases, also electricity. The positive pole is applied over the larynx, and the negative pole intralaryngeally.

Spasmus Glottidis is frequently observed in rhachitic infants, in *pertussis*, and as a reflex symptom in neurotic adults, also from pressure on the recurrent nerve. It is occasionally fatal in young children, particularly when the attacks come on at every effort to swallow. The spasmodic attack in whooping cough may usually be cut short by manipulating the lower jaw as in ether asphyxia. In severe cases in children intubation is indicated, and the patient should have fresh air, proper food, and hydrotherapeutic management.

Phonetic Spasm, a sudden complete or partial closure of the glottis with dyspnœa seen in hysteria and in professional speakers, requires hydrotherapeutic and tonic management.

Vertigo of the Larynx begins with a tickling, burning sensation, followed by coughing, vertigo, and occasionally unconsciousness. It is observed in neurotic individuals, and cases are on record in which this symptom disappeared after the removal of a nasal polypus or elongated uvula or hypertrophic lingual tonsil.

The *treatment* therefore is local and constitutional (cold douche).

Nervous Cough (reflex cough) and Trembling of the Vocal Cords are observed in neurotic individuals or as a reflex phenomenon from almost any organ of the body or from pressure of a tumor on the vagus. It is a hard, shrill cough with hardly any expectoration, and generally stops at night. If no underlying cause can be found, general hygienic measures, hydrotherapy, the bromides, and tonics, are indicated.

Paralysis of the Muscles of the Larynx may be of central origin or due to injury, pressure, or infectious disease (diphtheria) acting upon the superior laryngeal nerve or to injury, pressure, or infection acting on the recurrent nerve and the vagus. Hysterical paralyses are common. In *unilateral paralysis* the unaffected cord may compensate in phonation by moving beyond the median line. The voice in such cases is weak and hoarse and sometimes changes to a falsetto. In *bilateral paralysis* aphonia is complete and the prognosis grave, as also in those cases in which the glottis is closed (bilateral abductor paralysis).

Prognosis and Treatment.—The prognosis and treatment are based upon the ætiological factors. Central lesions, unless due to syphilis, give a bad prognosis. Pressure paralysis from cancer and aneurysm give an unfavorable prognosis. Paralysis from "operable" goitre or enlarged glands may be cured.

Hysterical paralysis requires moral, hygienic, and hydrotherapeutic treatment. In *bilateral abductor paralysis* intubation or tracheotomy is necessary to save life.

OFFICE FORMULÆ FOR NOSE AND THROAT TREATMENT

Salt water, ʒj to pint j, for spraying.

Dobell's solution, for spraying.

Listerine, diluted, for spraying.

Cocaine solution, 2 per cent and 10 per cent, for local anæsthesia.

Borax, ʒij, glycerine, ℥ij, water, ℥viij, for a spray in atrophic rhinitis.

Alum solution, 5 per cent, to check hæmorrhage. Apply on cotton as a tampon.

Nitrate of silver solution, 2 per cent and 5 per cent.

Trichloracetic acid in crystals, as a caustic.

Chromic acid in crystals, as a caustic.

Lactic acid, pure.

Albolene, benzoinated or with menthol, as a spray.

Orthoform powder for insufflation.

Tincture of iodine for painting externally.

Menthol, gr. v, camphor, gr. v, oleostearate of lime, ℥j, for nasal distress in colds. Use with a dropper.

Adrenalin chloride solution.

Adrenalin Solution:

℞ Suprarenal powder,	ʒj;	for local anæsthesia and for reducing œdematous and hyperæmic tissue.
Water,	℥j;	
Boil and filter.		
Add		
Formalin,	gtt. ij;	
Cocain.,	gr. x.	

Formulæ for Acute Rhinitis:

℞ Acid carbolic,	āā,	ʒj.
Alcohol,		
Tincture of iodine,		
Aquæ ammoniæ,		

M.: Cork with cotton. Snuff the vapor in acute rhinitis.

℞ Camphor,	ʒj;
Menthol,	gr. xv;
Chloroform,	ʒijss.

M.: Gives relief in acute rhinitis. Inhale a few drops from a handkerchief.

℞ Boric acid powder,	ʒij;
Menthol,	gr. x.

M. S.: Use as a snuff in acute rhinitis.

CHAPTER XVI

THE RESPIRATORY SYSTEM—*Concluded*

DEEP RESPIRATORY TRACT

SYNOPSIS: Clinical Features of Pulmonary Congestion, Œdema, Infarct, Abscess, Gangrene, Hæmorrhage.—Acute Forms of Bronchitis and Pneumonia in Adults.—Chronic Forms of Bronchitis and Pneumonia.—Emphysema of the Lung.—Pneumoconiosis.—Bronchiectasis.—Cirrhosis of the Lung.—Tuberculosis of the Lung.—Bronchial Asthma.—Acute and Chronic Forms of Pleurisy.—Pleurisy with Effusion.—Hydrothorax, Hæmothorax, Pyothorax, Pneumothorax.—Intrathoracic Tumors.—Affections of the Mediastinum.

CLINICAL FEATURES OF PULMONARY CONGESTION, ŒDEMA, ETC.

Pulmonary Congestion (Active, Passive, Hypostatic)

Ætiology.—Acute pulmonary congestion is regarded by some as a primary affection and by others as a symptomatic condition. Its ætiology is by no means clear in the present state of our knowledge. The causes and occurrences which lead to active hyperæmia are: Overaction of the heart, violent exertion, inhalation of irritants, extreme heat or cold, and alcoholic excess. It is frequently observed in epidemic influenza and in malarial disease, and all pulmonary disease is associated with congestion.

Clinically it resembles the first stage of pneumonia, and for this reason many physicians are led to believe that pneumonia can be aborted.

Symptoms and Physical Signs.—The onset is sudden, sometimes accompanied by a chill. The temperature, respiration, and pulse rate are high. There is hardly any dulness on percussion. The breathing is bronchovesicular, with fine râles. There may be cough, pain, and dyspnœa. The sputum may be frothy and bloody.

Treatment.—Dry cupping and hot strong coffee may be administered. As a rule acute pulmonary congestion subsides in from twelve to twenty-four hours, with or without treatment. In urgent cases venesection is indicated.

Passive Congestion may be mechanical, as in valvular heart disease and dilatation of the right ventricle, or from the pressure of a tumor.

SYMPTOMS.—The symptoms are dyspnœa, cough, and expectoration.

Hypostatic Congestion is observed in low fevers (typhoid), adynamic states, and cerebral apoplexy and coma.

SIGNS AND SYMPTOMS.—The signs and symptoms are not characteristic. There are dyspnœa, cough, frothy or bloody expectoration containing alveolar cells, a feeble pulse, usually no fever, slight dulness at the bases, feeble breathing sounds, and indistinct râles. It may be taken for pulmonary œdema, and vice versa.

TREATMENT.—The treatment is that of the associated or underlying condition. Free bleeding may be necessary, and aspiration of the right auricle has been performed, but must be condemned as a reckless procedure. Camphor and caffeine may be given subcutaneously and the patient should have his position in bed changed from time to time. General mild massage may be employed for the purpose of improving the circulation.

Pulmonary œdema is discussed in the chapter on Dropsy and Effusion.

Pulmonary Infarction or Apoplexy

Non-septic Infarction.—As a mechanical sequence of *embolism* and *thrombosis* of a pulmonary vessel, we occasionally observe a wedge-shaped *hæmorrhagic infarction in the lung* representing an infusion of blood into the air cells and interstitial tissues. A non-septic infarction is not infrequently observed in chronic cardiac disease and may cause sudden death, when it is very extensive, by blockage of a large vessel. Small infarctions may give rise to no symptoms or may be suspected by reason of a sudden development of dyspnœa, pain, cough, and bloody expectoration in patients with cardiac lesions.

SIGNS.—The physical signs in such cases are a circumscribed percussion dulness, increased vocal fremitus, pleural friction, and bronchial breathing, but without typical fever.

PROGNOSIS.—The prognosis in small non-septic infarction is not unfavorable, and the treatment is entirely symptomatic, with due regard to the underlying cause.

Septic infarction from a gangrenous or suppurating focus gives rise to about the same physical signs and symptoms as the non-septic form, but if the patient continues to live, the apoplectic area in the lung becomes gangrenous or there is abscess formation.

The prognosis is naturally grave in such cases. The *treatment* is symptomatic.

Abscess of the Lung

Abscess may follow all forms of pneumonia or pulmonary tuberculosis, or may result from perforation of neighboring pus cavities, and from cancers, foreign bodies, or hydatid cysts. In all cases of pyæmia, embolic or metastatic abscesses may be found in the lung as in any other organ.

Diagnosis.—The diagnosis is made by recognizing the physical signs of a cavity and by the character of the sputum, which has a peculiar offensive odor and often contains lung tissue and elastic fibres.

Prognosis.—Abscesses following pneumonia may end in recovery. Abscesses in pyæmic processes are usually fatal.

Treatment.—The patient must be placed in the best possible hygienic surroundings and must be liberally fed on eggs, meat, cereals, fruit, cacao, etc. Medication is useless in the management of lung abscess. If the abscess is accessible, it should be opened and drained.

Gangrene of the Lung

This is due to necrosis and putrefactive changes of areas of lung tissue from all the various causes which are known to produce gangrene in other tissues.

Symptom.—The distinguishing symptom is the very offensive odor of the patient's breath combined with evidences of sepsis, i. e., fever, rapid pulse, and prostration. Profuse hæmorrhage from erosion of a large blood vessel may occur, and from the septic focus many distant complications may arise.

Diagnosis.—The differential diagnosis between gangrene of the lung and putrid bronchitis may be difficult. An examination of the sputum in gangrene shows lung tissue, elastic fibres, and bacteria.

Prognosis.—The prognosis is grave. Limited gangrene may become encapsulated and finally heal.

Treatment.—The treatment is unsatisfactory. The patient should breathe dust free air and receive the best of nourishing food and stimulation. The bowels should move freely once or twice a day. Inhalations of creosote, turpentine, or eucalyptol are employed. If localization of an encapsulated necrotic area is possible, we may resort to surgical means to give vent to septic material.

Hæmorrhage from the Lungs (Hæmoptysis)

By hæmoptysis we understand a coughing up of pure blood, not an expectoration of blood stained mucus. Fatal hæmoptysis is rare and is due to rupture of an aneurysm or of a large sized vessel in the lung.

Lesser hæmorrhages are generally due to pulmonary tuberculosis, cardiac disease, disease of the blood vessels (syphilis, arteriosclerosis), hæmophilia, sepsis, or vicarious menstruation.

Symptoms.—Before a hæmorrhage sets in there are sometimes premonitory symptoms, such as cough and soreness in the chest. As a rule hæmoptysis occurs without warning, except perhaps a tickling sensation followed by cough, after which blood is felt in the mouth.

Source of the Hæmorrhage.—When the physician is called to a patient bleeding from the mouth and coughing up blood, a careful examination as to the source of hæmorrhage must be made at once, if possible. The bleeding may take its origin from the nose, pharynx, larynx, spongy gums, or the stomach.

The characteristics of pulmonary bleeding are the cough, the bright red color of the frothy blood, and the bubbling râles in the chest.

The patient is usually able to state whether the blood is coughed up or vomited.

Treatment.—The patient must rest in bed for a few days and may wear an ice bag over the affected lung and over the heart. A fluid diet with cool drinks and ice is advisable, and opium may be given to relieve cough and allay excitement. If a direct cardiac sedative is called for, tincture of aconite may be given in drop doses. To increase the coagulability of the blood, gallic acid is recommended in five to ten grain doses, also acetate of lead (gr. ij) with opium (gr. ¼) every two hours.

Clinical experience also favors the administration of ergotine by hypodermic injection and antipyrine (five grains every two hours) or suprarenal powder (five grains every two hours). In a case of persistent and recurrent hæmoptysis observed by the author, in a girl of sixteen, the bleeding was naturally and completely checked by the *tampon action of a massive pleuritic serous exudate which formed on the affected side.*

According to the experience of many careful observers (Flint among others) *pulmonary tuberculosis offers a more favorable prognosis as to duration of life when accompanied by bleeding than when this event is wanting.* After the hæmorrhage has completely ceased, the underlying cause should receive every attention.

ACUTE FORMS OF BRONCHITIS IN ADULTS

Acute and subacute bronchitis are catarrhal inflammations of the bronchial mucosa probably due to microbial infection following a "cold" or irritation from dust in the air, and are usually a downward extension of a nasopharyngeal catarrh or occur as symptoms or complications in influenza, asthma, tuberculosis, typhoid fever, cardiac and renal lesions, malarial disease, syphilis, rheumatism, gout, diabetes, and many other ailments.

Symptoms.—The general symptoms are coryza, tickling in the throat, lassitude, creeping chills, and fever (101° to 103°) in severe or complicated cases.

The cough is paroxysmal, rough, hard, sore, or dry at first, becoming loose in a few days. The patient complains of a sensation of tightness, compression, and rawness beneath the sternum, with pains in the chest, the back, and along the diaphragm, aggravated by coughing.

Dyspnœa is marked only when the smaller tubes are involved, in infants and in the aged and feeble.

Auscultation reveals harsh vesicular breathing; diffused, piping, sonorous or sibilant râles shifting and affected by the coughing, becoming mucous and bubbling; or subcrepitant râles if the finer bronchi are involved.

Percussion gives clear resonance, unless there are complications, or excessive resonance if there is an emphysematous condition of the lungs.

Palpation reveals bronchial fremitus when the chest walls are thin and when there is much secretion.

The *sputum* is clear, frothy at first, or mucopurulent, abundant in a few days, then purulent, with lumps of dried mucus, and is sometimes blood streaked.

The *voice* is sometimes husky or suppressed.

Prognosis.—The prognosis is favorable in mild cases, but grave in severe cases occurring in very young infants or in very old persons.

Differential Points.—In sudden and severe cases, bronchitis may simulate lobar pneumonia in the first stage. Acute miliary tuberculosis may be mistaken for simple bronchitis. In both instances subsequent developments will clear up the case.

Treatment.—Rest in bed in febrile cases if the patient is in an enfeebled condition. He should have a hot soda foot bath and take in one dose:

℞ Calomel,
Jalap, } āā, ... gr. x (for an adult).
Quinine sulph.,

He should also drink plenty of water, peppermint tea, or milk and Vichy water.

When the cough is harassing, five to ten grains of Dover's powder or one tenth of a grain of heroin may be given once at night. Sea air and a change of air are very beneficial in the convalescent stage. The severe form requires powerful expectorants (see Bronchopneumonia).

ACUTE BRONCHOPNEUMONIA (CATARRHAL PNEUMONIA; CAPILLARY BRONCHITIS)

This disease is due to infection and inflammation of the small air cells by various cocci and bacilli. It may be primary, but is usually secondary to bronchitis, influenza, measles, pertussis, scarlatina, variola, etc.

The disease may follow inspiration of food or drink, and is frequently observed after ether narcosis and in intubation cases or following operations on the mouth, nose, or trachea in children. Tuberculosis, malaria, rickets, and diarrhœal diseases predispose to this infection. It is most frequent in aged persons and young children. The onset is usually gradual and insidious; it is commonly bilateral, but occasionally unilateral. It occurs in endemics as a "house infection" in overheated houses, school dormitories, soldiers' barracks, lumber camps, hospitals, asylums, prisons, etc., and is most prevalent in winter and spring.

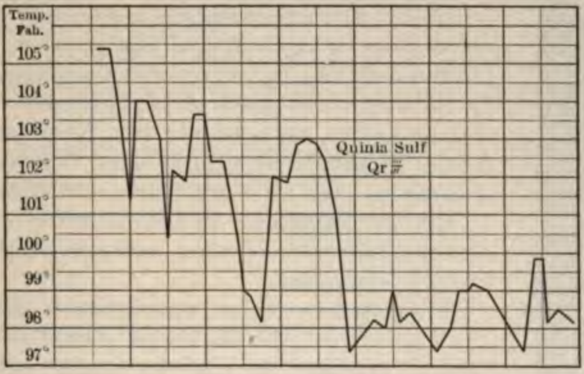

FIG. 140.—EFFECT OF ONE DOSE OF QUINIA IN A CASE OF MALARIAL BRONCHOPNEUMONIA.

Bronchopneumonia may terminate in resolution in a few days (or after weeks by lysis), in suppuration, in gangrene, or in fibrous changes (chronic bronchopneumonia). When resolution is delayed, we should examine the sputum for tubercle bacilli.

Inspection of a patient suffering from extensive bronchopneumonia reveals rapid, shallow, and difficult breathing (60 to 80 a minute); an anxious, distressed countenance and dilating alæ nasi; gradually increasing cyanosis with inspiratory retraction of the base of the sternum and of the lower costal cartilages.

Physical Signs.—On percussion the chest resonance is at first not impaired or may be somewhat tympanitic. After a day or two patches of impaired resonance can be made out.

Auscultation reveals vesiculobronchial breathing with subcrepitant or mucous râles and rhonchi and occasionally patches of tubular breathing. These physical signs are apt to change from day to day as some areas clear up and others become involved in the inflammatory process. Pleuritic pain may be present. The cough may be violent and distressing. The sputum is mucopurulent and sometimes blood streaked. In general we observe rather the signs of bronchitis than those of pneumonia. In severe cases the pulse is rapid, the fever is high, the patient is restless or delirious or comatose, and convulsions may set in toward the fatal end.

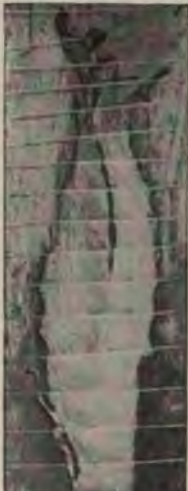

Fig. 141.—Diphtheritic Bronchial and Tracheal Cast (S. W. Kelley).

Prognosis.—The prognosis in feeble children and old people is grave. In older children and middle aged persons the prognosis in cases of ordinary severity is favorable.

Differential Points.—In lobar pneumonia the onset is sudden, the inflammation is generally one sided, defervescence is critical, and the sputum is rusty. In tuberculous bronchopneumonia the physical signs may be identical with those of the ordinary variety, and a discrimination between the two forms may be impossible. In simple bronchitis there is less dyspnœa and distress and the râles are coarse and sibilant.

Clinical Varieties.—In adults, as well as children, we see mild cases, severe cases, and grave septic cases with cerebral symptoms.

Prophylaxis.—Bronchopneumonia patients should be isolated and the discharges disinfected. In all catarrhal troubles the nasopharyngeal toilet should be practised and exposure to street dust and to bad air in crowded places should be avoided.

Treatment.—An adult with bronchopneumonia should have a hot foot bath and go to bed. Fever diet and cooling drinks are indicated, also a brisk purge and 10 grains of quinine. High temperatures are controlled by hydrotherapy and early stimulation with whiskey, wine, enteroclysis, and such drugs as camphor and strychnine are indicated in septic cases. Cerebral symptoms require the application of an ice bag to the head. The trunk may be enveloped in a sheet wrung out in cold water, this to be changed every hour or two if necessary. When there is difficulty in raising the secretions, the foot of the bed may be raised from six to eight inches to allow them to gravitate outward. Carbonate of creosote may be given in 5 to 10 grain doses several times a day, but should be discontinued when the stomach becomes irritable. A change of position is also desirable. In the aged and feeble cold baths are not to be used. Sponge baths will answer very well, as the temperature is not very high in old persons. Circulatory and respiratory stimulation is to be relied upon mainly, and digestion should be aided by giving hydrochloric acid after eating. (See General Therapeutics.) The management of bronchopneumonia in children is discussed in the Pædiatric portion of this work.

ACUTE TUBERCULOUS BRONCHOPNEUMONIA (HASTY, OR GALLOPING, CONSUMPTION)

Acute tuberculosis may result from direct infection or may be due to autoinfection from a preexisting tuberculous focus. All exhausting diseases predispose to it. It is met with in adults and in children, and not infrequently occurs after measles and pertussis or in young children, under the clinical picture of marasmus.

Differential Points.—Acute pulmonary tuberculosis is liable to be mistaken for some simple form of pneumonia, because the clinical symptoms and signs are very much alike and because the tubercle bacilli are not present in the sputum at first. When the tubercle bacilli are found, a simple form of pneumonia may be excluded.

In *typhoid fever* with extensive bronchitis we observe rose spots, tympanites, and the Widal reaction, without tubercle bacilli in the sputum.

Clinical Forms of Acute Pulmonary Tuberculosis

Pneumonic Form.—Abrupt onset with chill, remittent fever, frequent pulse, and hectic sweats; no leucocytosis.

Dulness over one lobe (usually the upper); eventually cavernous or amphoric resonance.

The sputum is scanty, mucoid, then rusty, mucopurulent, or purulent; tubercle bacilli; elastic tissue; perhaps hæmoptysis.

Duration, two to six weeks, occasionally two to four weeks.

Bronchopneumonic Form.—High, irregular fever, frequent pulse, rapid emaciation; chills and profuse sweats or a typhoid state.

Areas of impaired resonance, usually at the apex.

The sputum is purulent, blood stained, nummular; elastic tissue and bacilli; rarely hæmoptysis.

Not infrequent in young children after other acute infections.

Duration, three weeks to three months.

Miliary Form.—Repeated chills, fever (102° to 105°); very rapid, feeble, irregular pulse; profuse sweats; often vomiting at the onset.

Hurried respiration (possibly 50 or 60 in adults); cyanosis generally marked; spleen frequently enlarged.

Diffuse, sibilant or sonorous, mucous or crepitant râles; subpleural tubercle friction murmur, finer and softer than the pleuritic.

Perhaps defective resonance at the bases in children.

Dyspnœa very prominent from the outset without apparent cause.

Sputum mucopurulent; occasionally rusty; may contain tubercle bacilli; rarely hæmoptysis.

Duration, two weeks to several months.

Prognosis.—The prognosis of acute pulmonary tuberculosis is fatal.

Treatment.—The treatment is symptomatic.

Acute fibrinous or diphtheritic bronchopneumonia is a rare disease observed in children as well as in adults. (See Fig. 141.)

It may begin like a simple bronchitis or the onset may be severe with chills, fever, cough, and dyspnœa. When casts or membranes are expelled, there is a fall of temperature, which rises again if the casts form anew. In severe cases the patient dies of asphyxia and exhaustion in a few days. The mortality is 50 to 70 per cent.

Treatment.—Diphtheria antitoxine, in 3,000 unit doses, should be repeatedly given; saline inhalations, pilocarpine, gr. ⅛, expectorants, and stimulants are indicated, also mercurial ointment inunctions.

ACUTE LOBAR PNEUMONIA; FIBRINOUS PNEUMONITIS IN ADULTS

Lobar pneumonia is an acute, infectious, endemic, and occasionally epidemic disease beginning with a chill. Probably several microorganisms are pathogenic factors in this disease, especially Friedländer's *pneumobacillus* and A. Fraenkel's *Diplococcus lanceolatus*. The latter is of chief importance, since it is found in about 70 per cent of all cases of *fibrinous pleuropneumonia*.

Fibrinous pneumonia has a *catarrhal* and a *hæmorrhagic stage*. Both are usually included as the stage of congestion or engorgement. The lungs at this period show very little that is characteristic. They are dark red, still contain air, but are slightly firmer in consistence, and resemble mostly lungs affected with beginning hypostatic pneumonia.

The hæmorrhagic stage is followed by the *stage of red hepatization;* the alveoli become filled with red blood corpuscles and fibrin. The latter coagulates, and the whole hæmorrhagic contents of the alveolus become a firm red plug. The cut surface of *red* hepatization is red and slightly granular.

In the stage of *resolution* the fibrin undergoes granular disintegration and the cells undergo fatty metamorphosis.

Fibrinous pneumonia generally attacks but one lobe, more frequently the lower lobe, and the right lung more often than the left. Sometimes both lungs and a number of lobes are attacked at the same time, but more often the invasion is successive, i. e., affection of one lobe is followed by involvement of another, until a whole side is hepatized. In these cases there is an intense collateral hyperæmia of the non-hepatized area, because the hepatized parts are always anæmic in the stage of complete hepatization. Acute vicarious emphysema (temporary emphysema) is also observed in the unaffected portions of the lung and presents an additional obstruction to the circulation in the right heart. The collateral fluxion very easily gives rise to a *fatal pulmonary œdema* as soon as the heart begins to weaken as a result of the increased resistance and the injury caused by the high fever.

Fibrinous pleuritis is a constant accompaniment of fibrinous pneumonia as soon as the latter appears in lobar form and involves the pleura.

Every fibrinous pneumonia is attended by a violent bronchitis, acute catarrhal in the large bronchi and often fibrinous in the smaller, which may occasionally lead to filling and occlusion of the bronchi and bronchioli.

In some cases fibrinous pleuropneumonia is accompanied by a *purulent pleurisy* in which the *Diplococcus lanceolatus* is usually found. Sometimes, especially in topers and when putrid processes have previously existed in the lungs, pneumonia goes on to *gangrene*. Rarely the fibrinous exudate becomes organized and replaced by connective tissue, so that the lung tissue becomes impermeable to air and assumes a fleshlike appearance (*carnification*).

Under certain conditions fibrinous pneumonia may terminate in *caseous hepatization*, especially when tuberculosis or caseous processes previously existed in the affected lung and when dissemination of tubercle bacilli can occur from these foci.

Predisposing Factors.—Old age, overwork, debility, alcoholism, trauma, typhoid fever, measles, influenza, bronchitis, diabetes, tuberculosis, ether anæsthesia, chronic visceral disease, cold and damp weather, and previous attacks predispose. It occurs at all ages, and is more frequent in men. Pneumonia has a sudden onset (insidious in the aged) and ends by crisis in from five to nine days.

Physical Signs.—*Inspection* reveals an anxious expression, bright eye, dilated alæ nasi, labial herpes, pale face, or cyanosed with a mahogany flush on the checks; breathing hurried (30 to 60), but regular and noiseless, usually abdominal with deficient expansion on the affected side; posture often on this side; and the tongue dry and thickly coated. Early jaundice is common.

Palpation shows lack of respiratory expansion over the area involved; vocal and tactile fremitus increased on the consolidated side (absent if pleurisy or bronchorrhœa is present or a main bronchus is occluded); and sometimes pleural friction fremitus. Tenderness on pressure is complained of also, and there is a dry, burning skin followed by profuse critical sweats. On *percussion* we find sharply defined woody dulness (rarely tympanitic over the upper lobe on the affected side). By the second or third day dulness is observed over consolidation (most marked posteriorly). High pitched tympany or the cracked pot sound is elicited in the stages of engorgement and resolution and above a hepatized area.

On *auscultation* we hear inspiratory crepitant râles followed by typical bronchial breathing (provided the large bronchi are patulous), and later, in the stage of resolution, all sizes of moist râles; inspiration is short and suppressed, expiration grunting; bronchophony (most marked at the lower level of dulness) in the second stage; pectoriloquy or ægophony above a hepatized area with exaggerated vesicular murmur in normal portions of the lung; and the second pulmonary sound accentuated in the sthenic type.

The *cough* is short, dry, painful, and restrained at first; it may be absent in old people.

The *sputum* is scanty, glairy, viscid, becoming blood tinged rusty sputum within twenty-four hours; more copious and liquid during resolution; purulent or like prune juice in low types; usually absent in children. The microscope shows pneumococci.

The *pain* is unilateral, usually at the nipple or axilla, often agonizing and aggravated by cough or deep inspiration. Diffuse soreness is complained of.

Respiration is panting and frequent, but there is really less dyspnœa than in bronchopneumonia.

Generally speaking, there is an abrupt primary onset, with a distinct chill in adults and vomiting or convulsions in children; fever rises quickly to 104°-105°, falling by crisis in five to nine days; the pulse is full and bounding (100-120), becoming weaker; the pulse respiration ratio is two to one or less; leucocytosis (absent in grave cases), severe headache, delirium (cerebral symptoms may be marked in children and drunkards); chlorides in the urine are diminished or absent; the urine is high colored and perhaps contains a trace of albumin.

Clinical Varieties.—In adults, as in children, we may recognize various clinical varieties of pneumonia—the septic and malignant types, epidemic pneumonia, influenza pneumonia, pneumonia of diabetics, pneumonia of alcoholics, pneumonia of old age (which comes on without a chill), migratory, or wandering, pneumonia, so called bilious pneumonia, when the patient is jaundiced, and typhoid pneumonia (which may mean a typhoid condition due to sepsis in pneumonia or pneumonia complicating typhoid fever). As regards localization, we may observe the apex, the lower lobe, or the middle lobe, on one or both sides, involved.

A *true double pneumonia* is a very grave condition involving both sides.

A *massive pneumonia* gives absolute flatness on percussion, as in wet pleurisy, owing to a filling of the bronchi with exudate.

A *central pneumonia* is a deep seated localization of the inflammatory process in which we have all the clinical evidence of pneumonia, but fail to elicit dulness on percussion until the consolidation has reached the periphery of the lung.

Differential Points.—In hypostatic congestion of the lungs the temperature curve is not typical; dulness on percussion is often bilateral; typical bronchial breathing is absent. The sputum is not rusty. The distinguishing features in bronchopneumonia are discussed under Bronchopneumonia.

In acute pulmonary œdema there is sudden cough, with intense dyspnœa and usually no fever; bronchial breathing is absent; the respiratory sounds are weak; subcrepitant râles are heard over both sides; the sputum is frothy and may be of a pale bright red, but is never "rusty."

In pulmonary infarct, or apoplexy, we observe sudden dyspnœa and cough, a circumscribed area of dulness, little fever, and a very bloody sputum which is *not* "rusty."

Acute pulmonary tuberculosis will extend over the ninth day, and tubercle bacilli will appear in the sputum. The temperature curve is not typical.

In pleurisy with effusion the physical signs differ. There may be distant bronchial breathing. The intercostal spaces bulge on deep inspiration; there is no sputum. The needle reveals fluid.

Prognosis.—The *prognosis* is favorable in children and grave in adults. The disease is particularly fatal in drunkards and those afflicted with chronic disease. A pregnant woman who contracts pneumonia is dangerously ill and is apt to abort. Pneumonia is very fatal in plethoric and fat persons.

Prophylaxis.—Pneumonia is most prevalent during cold and damp weather. Persons having a "cold" should not attend a theatre or church or any function involving a large gathering of people. Living and sleeping apartments should be well ventilated and not heated above 68° to 70°. All sputum should be destroyed and the mouth and nasopharynx of the patient and attendants should be kept clean.

Treatment.—Lobar pneumonia is a self-limited disease for which there is no specific curative treatment at the present time. The patient should have rest and breathe cold fresh air. When a person becomes ill with symptoms of pneumonia he should take a hot foot bath and a brisk laxative.

℞ Podophyllini, ... gr. ss;
Calomel,
Quinin. sulph., āā, ... gr. x;
Pulv. aromatic, ... gr. iij.
M. S.: For one dose, in a wafer.

This dose will bring away accumulations from the intestines and counteract any malarial factor.

The patient remains in bed and is put on liquid or fever diet. Enteroclysis should be practised daily, and hydrochloric acid may be given to aid digestion.

It is alleged that carbonate of creosote, in 5 to 10 grain doses every three hours, has a beneficial influence in pneumonia. The writer has not observed striking results from its administration in a number of cases.

As circulatory failure in pneumonia is probably due to sepsis (toxæmia) and pulmonary obstruction combined with a strain upon the right heart. Early bleeding to the extent of ℥x to ℥xv is indicated as soon as respiration becomes embarrassed and the veins are seen to fill up when a constriction is placed around the upper arm.

After venesection drug stimulation may be tried as follows:

℞ Camphoræ,
Pulv. digitalis, āā, ... gr. ij;
Acid benzoic, ... gr. v.
In a wafer.
M. S.: One every four hours until eight are taken.

Or we may give strychnine sulphate, gr. $\frac{1}{30}$ to $\frac{1}{20}$, alternating with camphorated oil, gtt. x to xx, subcutaneously, or caffeine sodium benzoate, gr. ij to v, by the mouth or subcutaneously, or nitroglycerine, gr. $\frac{1}{100}$, or ext. digitalis fluid., gtt. ij to v, subcutaneously.

Generally speaking, drugs have very little influence in counteracting heart collapse. Whiskey is a food and stimulant, and can be given in large quantities if necessary, ℥ij to ℥xvi in the course of a day.

High Temperature with Delirium and Cerebral Symptoms.—To reduce very high fever, we employ hydrotherapeutics: Cool sponging, the cold pack, tub baths, 80° to 100°, warm mustard baths, 100°, or an ice cap to the head (see General Therapeutics).

Local pain may be controlled by applying an ice bag or hot water bag to the seat of pain, or by cupping (dry or wet). Exceptionally a hypodermic injection of morphine (gr. ¼) may be administered. Expectorants, such as liq. ammon. anisatus (gtt. ij to v) are indicated after resolution is evident. Cooling drinks, such as ginger ale and carbonated water, with and without champagne, are always indicated. The sputum and stools are to be disinfected and removed from the sick room as soon as possible.

The diagnosis and management of complications such as pleurisy and empyema, endocarditis, meningitis, nephritis, parotitis, peritonitis, otitis, enterocolitis, embolism, etc., are discussed under their respective headings.

CHRONIC FORMS OF BRONCHITIS AND BRONCHOPNEUMONIA

Simple Chronic Bronchitis

Simple chronic bronchitis may follow repeated attacks of acute bronchitis, and is commonly met with in chronic cardiac pulmonary and renal disease, also in arteriosclerosis and syphilis. It is the winter cough of old people and is frequently associated with *emphysema* of the lungs.

Symptoms.—Shortness of breath on exertion. Freedom from cough in the summer, but a persistent cough in the winter, the chief distress being night and morning. The expectoration is mucopurulent or the cough may be dry. There is usually no fever, and the general health may be good with a tendency to emphysema and bronchiectasis.

Physical Signs.—The chest is usually distended and the movements are limited, with diminished vocal fremitus in emphysema.

Auscultation reveals expiration prolonged and feeble or wheezing, with diffuse, bilateral piping and snoring rhonchi or moist râles of all sizes (often crepitant at the base).

Clinical Varieties.—In addition to the ordinary variety just described, we occasionally meet with cases of excessive bronchial secretion for which the term *bronchorrhœa* has been coined (purulenta and serosa). This variety is not to be confounded with bronchiectasis.

Putrid bronchitis is met with in adults and children in connection with bronchiectasis, gangrene, abscess of the lung, or perforating empyema.

Bronchitis with calcareous masses in the sputum is very rare.

Dry catarrh with severe paroxysms of coughing without expectoration is often met with in older persons. In all cases of chronic bronchitis the sputum should be examined for tubercle bacilli. In all forms of chronic cough the sputum should be destroyed or disinfected, as it is a common experience to *observe house infection with bronchitis and bronchopneumonia* when such precautions are not taken.

Chronic Fibrinous Bronchitis

Fibrinous bronchitis is a rare disease. It occurs in both the acute and the chronic forms.

Symptoms.—The symptoms in the chronic form are, as a rule, not urgent. The attacks usually follow upon long continued bronchial catarrh. The disease may last for years, the paroxysms recurring at regular or irregular intervals. Physical exploration of the chest during the attack often reveals little that is distinctive. The respiratory murmur is usually more or less suppressed over the region of the occluded bronchi. Râles may be heard if there is accompanying bronchial catarrh. A flapping sound, as in membranous croup, has been described in some cases when the casts have become loosened in the bronchi. After expulsion of the casts respiration may be heard in the parts of the lung before impervious to air.

Diagnosis of Fibrinous Bronchitis.—Fibrinous bronchitis can be diagnosticated with certainty only when the characteristic arborescent casts are expectorated.

Prognosis. — In the chronic form the prognosis is more favorable as regards life, but doubtful as regards complete restoration.

The **treatment** is that of chronic bronchitis.

Treatment of Chronic Bronchitis.—The patient requires fresh air and a liberal diet. The bowels should move once a day, and five drops of dilute hydrochloric acid may be taken after meals, to aid digestion. Extremes of cold are to be avoided if possible, but the patient should sleep in a cold room with the windows open in a pure dust free atmosphere. General massage will exert a favorable influence on the circulation. Alcoholic stimulants and tobacco may be used moderately.

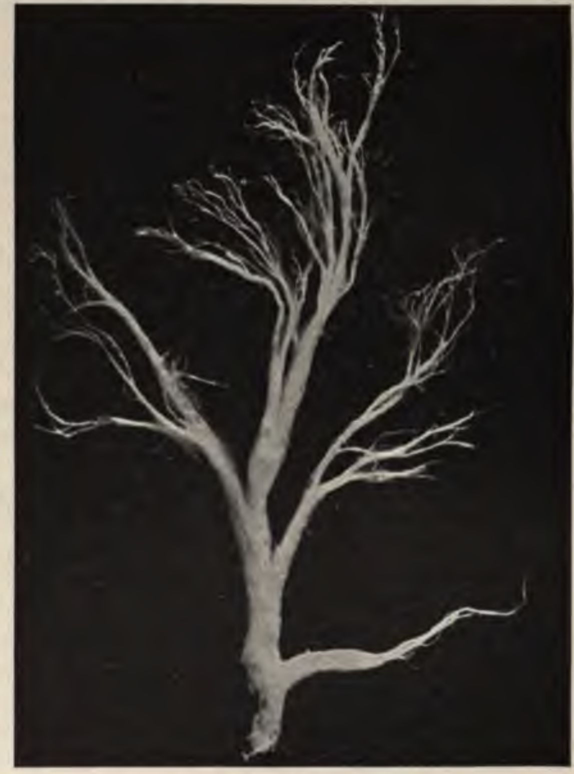

FIG. 142.—FIBRINOUS CAST OF THE BRONCHI. Natural size. (Wood.)

The nose and throat should be kept moist by means of salt water and benzoinated albolene spray.

Expectorants: Liquor ammoniæ anisatus, five drops every four hours in sugar water.

℞ Camphoræ, } āā, ... gr. ij;
Pulv. digitalis, }
Ext. hyoscyami, ... gr. ½.

In a wafer; one three times a day.

℞ Elixir of terebene hydrate with heroin. A tablespoonful four times a day.

℞ Potass. iodid.,	ʒij;
Liq. ammon. anisat.,	ʒj;
Tinct. opii camphorat.,	ʒij;
Aquæ,	℥iij;
Syrupi tolutani,	ʒjv.

M. S.: A tablespoonful four times a day.

Emphysema of the Lung

Interstitial Emphysema results from violent expiratory efforts, as in whooping cough. A rupture of air vesicles takes place and air escapes into the interlobular connective tissue. In rare instances the air passes along the trachea into the subcutaneous tissue of the neck. This condition is not serious and requires no special treatment.

Compensatory Emphysema of the lung is observed in pulmonary cirrhosis, in pleural adhesions, or pleurisy with effusion, or in all conditions in which some portion of the lung is compressed or cannot expand and another portion of the lung must expand (become emphysematous) or the chest wall sink in.

Hypertrophic substantive, or idiopathic, emphysema is a well marked clinical affection due to enlargement of the lung from a distention of air cells. It occurs in children and adults.

Causes.—Chronic bronchitis; violent straining of the lungs as in whooping cough, asthma, heavy lifting, or glass blowing, or the work of blacksmiths and players on wind instruments; and narrowing of the air passages by new growths. Heredity predisposes.

In all straining efforts and in cough the glottis is closed and the chest wall compressed by muscular effort. This high intraalveolar tension, acting upon a congenitally weak lung tissue, probably results in emphysema.

General Characteristics of an Emphysematous Person.—A barrel-shaped chest; slow, abdominal respiration; forced expiration with bulging of the soft parts; inspiratory retraction of the soft parts; wide intercostal spaces; epigastric pulsation; dilated cervical veins; prominence of the accessory respiratory muscles; a swollen, cyanotic face; round shoulders; stooping posture; feeble pulse and apex beat; cardiac hypertrophy; gradual loss of flesh and strength; temperature usually subnormal; dropsy with dilated right ventricle; enlargement and displacement of the liver and spleen.

Percussion reveals gradually extending, bilateral, drumlike, excessive resonance (reaches lower than normal) and the cardiac dulness commonly obliterated.

Auscultation shows vocal resonance usually diminished; inspiration shortened; expiratory sound much prolonged, low, soft, and breezy (harsh and wheezy if there is asthma, with fine bubbling, mucous sibilant, and sonorous râles); perhaps crumpling sound like folding of parchment at the end of deep inspiration; second pulmonary sound accentuated; apex sounds diminished, often with a fine systolic murmur; and a crackling sound in the interstitial form.

There is frequent cough, with a sense of constriction below the ribs, and even slight effort produces expiratory dyspnœa with occasionally severe asthmatic attacks. The sputum is frothy and viscid, but may be profuse and purulent if the trouble is associated with chronic bronchitis. The course of this disease is slow and progressive.

TREATMENT.—The treatment is that of chronic bronchitis. In attacks of urgent dyspnœa and cyanosis venesection is indicated. General massage is beneficial. Strychnine may be administered internally.

Atrophic Emphysema is a senile change with no enlargement of the thorax.

Pneumoconiosis

Pneumoconiosis is a chronic interstitial pneumonia due to the inhalation of dust incident to special employments. According to the cause, we recognize anthracosis (coal miner's disease), chalicosis (stone cutter's or grinder's disease), and siderosis (metal worker's disease), etc. In all such cases, a sputum examination will show the characteristic dust particles.

General Characteristics.—Very gradual emaciation and loss of strength; slight continuous fever or none; pulse 100 or upward.

The affected side is more or less immobile and shrunken; the intercostal spaces are obliterated; the heart is drawn over to the affected side; and there is spinal curvature with the shoulder drawn down.

On *palpation* we note increased vocal fremitus over the affected area unless masked by retraction and pleuritic complications; the apex beat displaced toward the affected area.

Percussion reveals perhaps persistent absolute dulness, with woody resistance at the base or apex; flat tympany or amphoric sound over a sacculated bronchus; excessive resonance on the sound side.

Auscultation shows cavernous or amphoric breathing at the apex—blowing or feeble (even suppressed)—with bubbling râles at the base; usually bronchophony; a cardiac murmur late in disease.

The cough is chronic and paroxysmal with very little pain.

There is slight shortness of breath, especially on exertion.

The sputum is mucopurulent and may be fœtid, and later there is bleeding from the lung.

Duration.—The disease is very chronic and may extend over ten to thirty years. Death results from intercurrent disease, hæmoptysis, or cardiac or respiratory failure.

Treatment.—The treatment is the same as for chronic bronchitis. If possible the patient should live an outdoor life in a mild climate. Hydrochloric acid may be given to aid digestion, and heroin or morphine to overcome distressing cough in terminal stage.

Pulmonary Actinomycosis is an invasion of the lung by the ray fungus (*Streptothrix actinomyces*). The *symptoms* are those of putrid bronchitis, pulmonary abscess, or chronic tuberculosis, with irregular fever and offensive sputum. An empyema may result. The organism is found in the sputum as sulphur colored granules. G. R. Butler, M. D., has reported a case terminating in recovery under the use of oil of eucalyptus (*Medical News*, April 29, 1898).

Syphilis of the Lungs may simulate chronic phthisis. In a number of cases observed by the writer the *symptoms* were cough, fever, and frequent small hæmorrhages in patients with a clear history of syphilis. The sputum examination was negative as to tubercle bacilli.

The TREATMENT is that of chronic bronchitis, in connection with proper hygiene, a liberal diet, and an inunction course.

BRONCHIECTASIS

Cylindrical or sacculated dilatation of the bronchi occurs in connection with the following conditions: Chronic bronchitis, emphysema, phthisis, catarrhal and interstitial pneumonia, chronic pleurisy, congenital atelectasis, foreign bodies, in or external pressure on the air tubes. The weakening of the bronchial walls is the most important factor in inducing bronchiectasis.

The **symptoms** are those of the original disease, and the condition is suspected only when the patient, during a severe paroxysm of coughing and in changing his position, raises a large quantity of mucopus having a peculiar, somewhat fœtid odor. The secretion is a copious, gray brown fluid, mucopurulent, acid, or fœtid (Dittrich's plugs), and separates into three layers —frothy, watery, and granular.

The *physical signs* are not always typical. In typical cases there are local diminished vesicular murmur and diminished vocal resonance; cavernous or amphoric sounds in the affected area, with mucous râles after a coughing fit. If there is extensive sacculation, we observe a contracted side and cyanosis on exertion; also clubbed finger tips and incurved nails in advanced cases. Vocal fremitus is sometimes suppressed, but generally increased, and there may be rhonchal fremitus. The breathing may be cavernous, cracked pot, or amphoric, or a limited area of impaired resonance may be noticeable, due to an accumulation of secretions usually in the lower or middle part of one lung (the right as a rule). There may be moderate fever, night sweats, diarrhœa, emaciation, rarely hæmoptysis, and metastatic abscesses in the brain and elsewhere.

The **treatment** is that of chronic bronchitis.

Cirrhosis of the Lung (Chronic Interstitial Pneumonia)

Fibroid changes in the lung tissue are circumscribed (local or diffuse). In the vast majority of cases such changes are unilateral and the unaffected lung is emphysematous. The fibroid lung is airless and hard, the pulmonary artery shows atheromatous changes, and the heart is hypertrophied.

Causes.—Cirrhosis of the lung may be a sequel of lobar pneumonia and bronchopneumonia, or it may result from chronic pleurisy and be a consequence of syphilis or pneumoconiosis. When it is of a tuberculous nature, we speak of fibroid phthisis, which is clinically identical with fibroid pneumonia.

Treatment.—The treatment is that of chronic bronchitis.

CHRONIC PULMONARY TUBERCULOSIS; TUBERCULOUS BRONCHOPNEUMONIA; CONSUMPTION; PHTHISIS

Pulmonary tuberculosis is a communicable, preventable, and curable disease. As an early diagnosis is of great practicable importance, two stages of the disease will be discussed: The incipient stage and the pronounced type.

The Incipient Stage.—Long before the localized physical signs of tuberculous infection are plain, the disease may be suspected and diagnosticated by careful observation.

ANAMNESIC DATA.—Heredity, anæmia, bronchitis, pleurisy, syphilis, and all exhausting conditions, bad habits, dissipation, grief, worry, overwork, and insufficient nourishment are predisposing factors in tuberculous infection. Pulmonary tuberculosis is most common in thin, tall people, with winged scapulæ and long, narrow chests, flattened from front to back, and sloping ribs without sufficient respiratory capacity.

Inquiry as to prolonged contact with a tuberculous patient or living in a notoriously infected sleeping room is of importance. In unmarried young women irregularity of menstruation has been noticed in the "pretuberculous stage."

SYMPTOMS.—The following general symptoms may be observed: Early slight fever in the afternoon or following exertion; later, continuous remittent or intermittent fever (temperature frequently subnormal in the morning); early anorexia; gradually increasing debility and loss of weight; pulse frequent and soft, but full; chloroanæmia, including ar anæmic condition of the upper respiratory tract; early vasomotor disturbances (chilly sensations and flashes of heat), and often slight pleuritic pain.

Pleuritic friction sounds may indicate infection of the pleura long before there is the slightest evidence of infection of the lung proper. Occasionally hoarseness or aphonia is the most prominent symptom which brings the patient to the physician. Gastrointestinal symptoms may be prominent and overshadow the pulmonary disease. In other instances bleeding from the lungs, when not of a vicarious nature, is the first prominent symptom; or a slight but persisting cough is complained of in addition to general lassitude, pallor, and loss of flesh.

The *physical signs* are usually apical at first; early feeble (or harsh and rude), higher pitched breath sounds, with prolonged expiration; jerky or wavy cog wheel rhythm on deep inspiration; vesiculobronchial, then whiffing and bronchial breathing with consolidation; localized subcrepitant, sibilant, and clicking râles, becoming bubbling and gurgling, blowing, or tubular (often heard distinctly if the patient coughs and then takes a deep inspiration); early impairment of resonance beneath and above one clavicle. Fluoroscopy shows early diminution in apical transparency, enlarged bronchial glands, local opacity from pleural thickening, and restriction of diaphragm motions. Lymph nodes above the clavicle on the affected side may be palpable.

In those instances in which the *physical signs* are quite negative, and we suspect incipient tuberculosis, a temperature record must be obtained, the temperature to be taken in the rectum twice daily for a period of weeks. A frequent or occasional elevation of temperature, in the absence *of chronic malarial disease or other distinct causes, is strongly suggestive of incipient tuberculosis.*

In cases in which it is impossible to come to a satisfactory diagnosis of an abnormal condition, the *tuberculin test* is advisable. One minim of Koch's tuberculin is mixed with one ounce of a half per cent carbolic acid solution. Ten drops of this solution represent one tenth of one milligramme of tuberculin, and may be injected anywhere under the skin. In the absence of a decided rise of temperature, two, three, or five milligrammes may be injected at one time. A decided rise of temperature following such injections is highly suggestive of incipient tuberculosis. It is maintained by some observers that the tuberculin reaction can be obtained in a certain number of cases of syphilis. The author has no personal experience to report regarding this point.

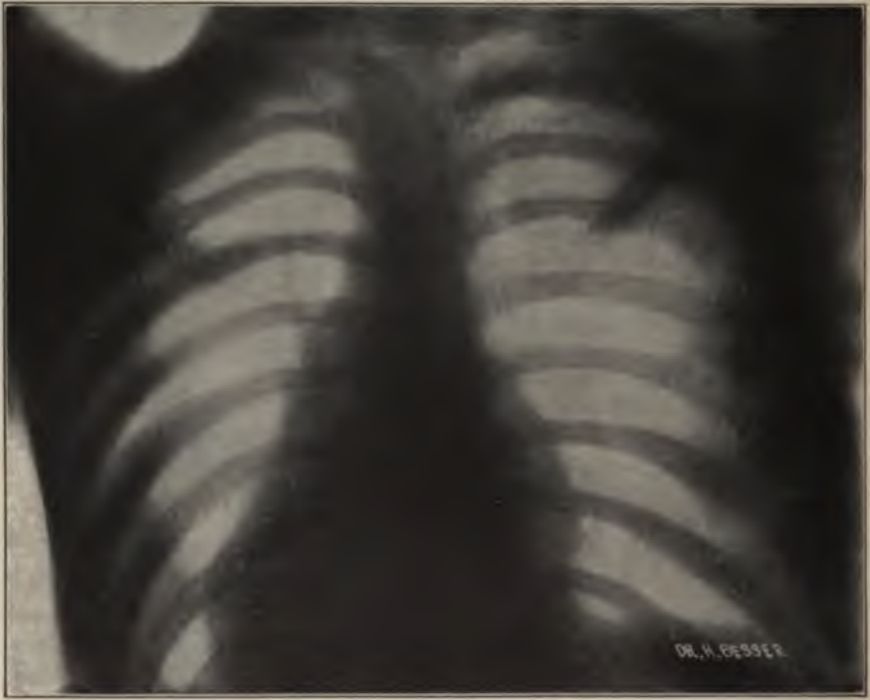

FIG. 143.—SKIAGRAM OF NORMAL THORAX.

At the British Congress on Tuberculosis, in 1901, Robert Koch stated his belief that tuberculin injections were a valuable diagnostic means without danger. When the first injection gave a faint reaction, the second injection generally gave a marked reaction in tuberculosis. His observations were based on 3,000 cases under his own control.

Drs. Osler, Heron, McCall, Anderson, France, and Moeller thought that the use of tuberculin as a diagnostic test was valuable and safe. The author has used tuberculin as a test on many occasions and knows of no ill results except in one case, that of a child six years old afflicted with skin tuberculosis. After an injection of one milligramme of tuberculin the normal temperature rose to 104° and three weeks later tuberculous meningitis set in which ended fatally. The autopsy showed a general miliary tuberculosis.

For the detection of incipient tuberculosis an x ray examination appears to be of some value. The patient is placed in front of and an inch from the tube. The fluoroscope is applied to the bare chest and passed up and down the thoracic region in search for tuberculous deposits or foci. A slight difference in the clearness of the apices may be left out of consideration, but a "spotted " lung is suspicious.

In the present state of our knowledge and experience, the x ray view may be corroborative, but is not diagnostic of localized tuberculosis and is useless and misleading in the hands of an untrained physician.

Pronounced and advanced cases of pulmonary tuberculosis are readily recognized by the finding of the tubercle bacilli in the sputum and by the physical signs in the chest.

EXAMINATION.—*Inspection and palpation* show depression above or below one clavicle; often a wide area of cardiac impulse; short breathing, confined mainly to the lower third of the chest, with a retracted abdominal wall; quivering nostrils; a hectic flush, and general flushing on slight excitement; chloasma and pityriasis versicolor, a red line around the border of the gum; multiple ulcers of the tongue; and clubbed finger ends with curved, cracked nails in very chronic cases. Local defective expansion is usually apical; tactile fremitus may be increased, particularly in the later stages, with cavity formation, unless the pleura is also much thickened; sometimes rhonchial fremitus; often soreness to the touch over the diseased parts;

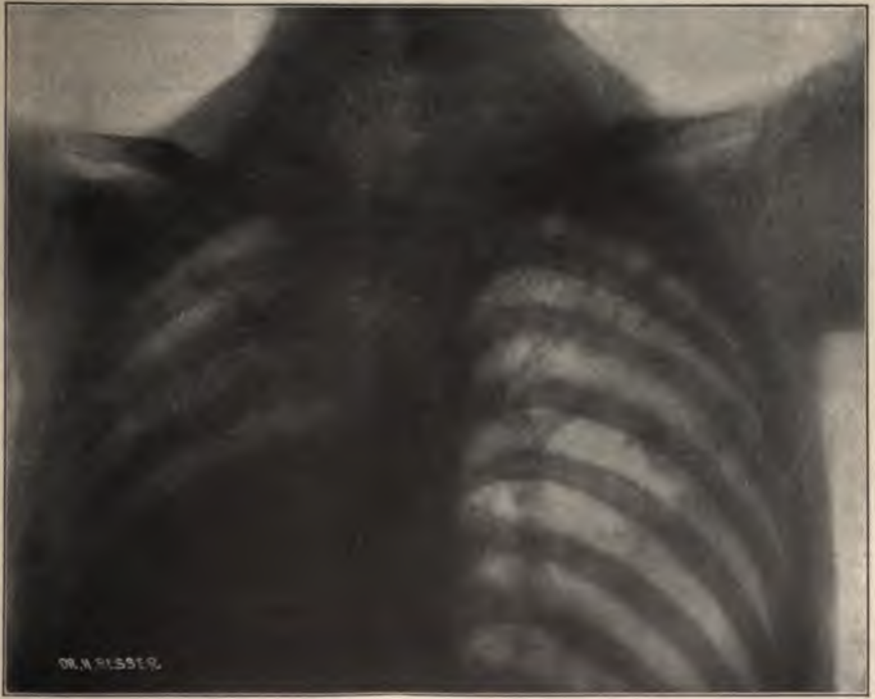

FIG. 144.—SKIAGRAM. Right lung cavernous, left lung consolidated.

swelling of the cervical lymph glands; and often dryness and harshness of the skin and hair.

Percussion reveals dulness or flatness over a consolidation, which may be tympanitic or pseudocavernous where the consolidation is located around a bronchus or near the trachea. Percussion over large cavities gives the *cracked pot sound,* which is usually higher and louder when the mouth is open. Dulness and flatness are also elicited over cavities filled with fluid and over fibroid changes or dense pleuritic adhesions.

Auscultation shows tubular breathing or cavernous or amphoric breathing sounds, rarely pectoriloquy over deposits and cavities; pleuritic friction sounds; often early diffuse cardiorespiratory whiffing (systolic bruit heard best during inspiration); commonly a pulmonary and subclavian systolic murmur; the second pulmonic sound accentuated; and the heart sounds heard posteriorly at the apex with undue distinctness.

The *early cough* is dry and hacking (noticed on going to bed), or there is slight morning hawking and clearing of the throat, the cough becoming paroxysmal, looser, and more constant; distressing at night and on rising in the morning (from accumulated sputum) in the advanced stage; most marked when the patient is lying on the affected side in the early stage, on the sound side in the advanced stage.

Pain, which may be sharp and is usually stabbing, felt near the nipple, or there may be a constant persistent, indistinct soreness and aching about the apex.

Dyspnœa is not usually prominent until the very advanced stage.

The *sputum* is slight or absent at first; frothy, mucoid, and homogeneous (viscid and gelatinous if there is much pneumonic disturbance), becoming more copious, opaque, purulent, greenish yellow, often blood tinged, and with a sweetish odor. It is most abundant on rising. *Hæmoptysis* is common and often occurs early. Cheesy particles containing tubercle bacilli, elastic tissue, cocci (mixed infection), and many red corpuscles are expectorated.

The *voice* is hoarse or aphonic when the larynx is affected.

In addition, there may be venous and capillary pulsation, drenching sweats at night or during sleep (most marked after cavity formation), late, obstinate diarrhœa, often albuminuria, a peculiar hopefulness, and rarely Curschmann's spirals in the sputum. Eosinophile cells in the sputum are of favorable import.

Repeated detection of the tubercle bacilli in the sputum will enable us to distinguish between *chronic bronchitis, bronchiectasis, and other forms of chronic cough and tuberculosis.* A single finding of the bacilli is not conclusive, as they get into the sputum from breathing dust which contains them.

Fibroid Phthisis.—One of the clinical varieties of pulmonary tuberculosis is the so called fibroid phthisis, which is clinically identical with chronic interstitial pneumonia and is distinguished by the finding of the tubercle bacilli in the sputum. The affected side is retracted and shrunken, the expansion poor, the percussion note dull, the breathing bronchial with râles. Patients may live many years with this form of tuberculosis.

Lesions in Chronic Tuberculosis of the Lung

Miliary form, tuberculous bronchopneumonia, caseation and ulceration (cavities), fibroid changes, and pleurotuberculosis.

Complications.—Laryngeal phthisis, pneumonia, pleurisy, with effusion or dry, interstitial tuberculosis, tuberculosis of the genitourinary tract, endocarditis, meningitis. aphonia and dysphagia, pneumopyothorax, fistula in ano, amyloid disease, neuritis.

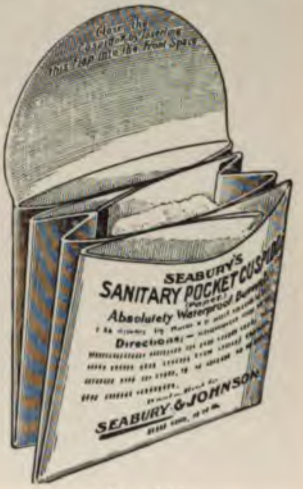

FIG. 145.

Prognosis.—In the early stages *tuberculosis may be thrown off*. In advanced cases the prognosis is unfavorable. Hæmorrhages, unless excessive, *do not increase the gravity of the prognosis*. When there is no hereditary tendency to tuberculosis, the prognosis as to ultimate cure is better than under other conditions. As regards duration of life, we must remember that the constitutional resistance varies with the individual, and constitutional resistance is an imponderable factor.

The unfavorable symptoms are a rapid pulse, persistent slight fever, steady loss of weight, chronic diarrhœa, laryngeal tuberculosis, etc.

Death takes place in consequence of respiratory failure, circulatory failure, hæmorrhage, asphyxia, or cerebral coma.

Prophylaxis.—The battle against tuberculosis is a fight against social misery and against the tubercle bacillus.

PRIVATE PROPHYLAXIS.—The marriage of a consumptive should not be encouraged. A pregnant tuberculous woman should lead an outdoor life and make every effort to improve her condition in order that her offspring may benefit bodily and constitutionally. A new-born child should not be nourished at the breast of a tuberculous mother. A healthy wet nurse should be provided or the child be fed on sterilized and modified cow's milk. Kissing on the mouth is to be forbidden, and a tuberculous mother must not put spoons containing food for her children into her own mouth before feeding them. In every way possible consumptives must be kept away from children. The child should at an early age become accustomed to cold water sponging and be instructed in respiratory and general gymnastics. If the child is affected with tuberculous glands or adenoids, they should be removed. If possible, such children should be raised in the country or at the seashore, and every at-

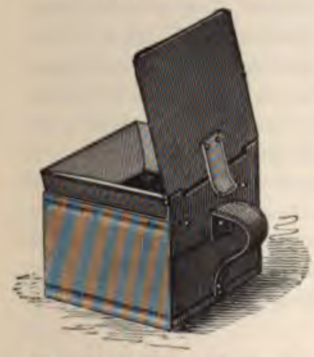

FIG. 146.—PAPER CUSPIDOR.

tention must be given to the nourishment of the child. At the termination of the school period an outdoor occupation is to be selected.

The following instructions may be given by the physician to the patient suffering from tuberculosis: The sputum is the main agent for the conveyance of the virus, and it should be deposited in cheap muslin squares and burned, or in cuspidors containing an antiseptic substance (formalin, chlorinated lime). Overcrowding, defective ventilation, damp and dark dwellings, alcoholism, and syphilis are predisposing causes of disease, diminish the chances of cure, and are factors in reinfection. Sunshine and fresh, dust free air (outdoor life) are the natural antidotes of the tubercle virus. Patients who live an indoor life and have an indoor occupation must give it up for an outdoor life and an outdoor occupation. *There is no special climate for tuberculosis.*

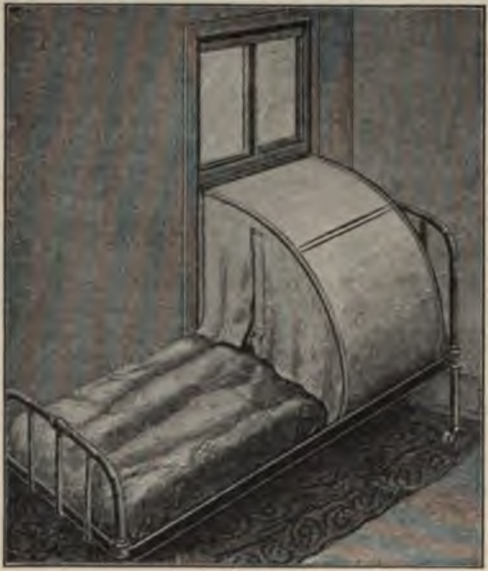

Fig. 147.—Window Tent for Open Air Treatment at Home. (Dr. S. A. Knopf.)

Treatment.—The modern management of pulmonary tuberculosis comprises educational, prophylactic, hygienic, and dietetic measures, such as climatotherapy, aerotherapy, hydrotherapy, rest cure and exercise, dietetic management, and personal hygiene.

Medication plays a minor rôle in the management of tuberculous patients. Treatment may be carried out at a private home in the *city*, in the *country*, or at the *seashore*, or at a *sanatorium*. The principles of treatment are best carried out by enlisting the cooperation of the patient. To this end a popular treatise on tuberculosis should be placed in the hands of the sufferer. The prize essay *Tuberculosis, a Social Disease,* by Dr. S. A. Knopf, of New York, is admirably adapted to this purpose on account of its clear cut portrait of the disease and its hopeful tone as regards curability.

Climate.—Regarding climate, it may be stated that *there is no particular or special climate which can be looked upon as a conditio sine qua non in the treatment of the infected individual.* All things being equal, *an outdoor life* in a *cold, dry, and clear air at a rather high altitude offers the best chances for a cure.* For the guidance of those who are willing and able to travel, the following suggestions are offered:

Marine Climate	*Dry Climate*	*Mountain Climate*
Madeira.	Egypt.	Colorado.
Canary Islands.	Mediterranean Basin.	Montana.

Marine Climate.	*Dry Climate.*	*Mountain Climate.*
Santa Barbara, Cal.	Fort Bayard, New Mexico.	Wyoming.
West Indies.		Mexico.
Florida.		Adirondacks.
Sea voyages in the temperate zone.		Sullivan County, N. Y.
		North Carolina.

Scrofulous children do well at the seashore; elderly people and those who take but little exercise or are afflicted with chronic cavities may go to a dry climate; younger persons with early consolidation improve in a mountain climate.

SANATORIUM TREATMENT has great advantages as regards supervision of the patient and enforcement of the principles of the treatment. A residence of six months at a properly conducted sanatorium and a return to a clean house and a clean outdoor occupation will be of very great benefit to a large class of patients with incipient tuberculosis whose circumstances will not warrant a stay of from one to two years in an institution. Inasmuch as the poor and ignorant class of people are the disseminators of tuberculosis, it is the duty of the State, from a humane and prophylactic point of view, to provide sanatoria at which the unfortunate could receive proper care and engage in some light occupation. The funds for such purposes should be raised by taxation.

HOME TREATMENT is feasible in the city, in the country, or at the sea-shore. When a tuberculous individual is to be treated at his home, he should first of all be educated as outlined under *Prophylactic Treatment*, in order that he may not be a menace to his surroundings. A fever temperature and a pulse above 90 make a rest cure desirable. In the city this would practically mean resting in a reclining chair in a sunny room (or garden or roof tent) with the windows wide open day and night. Such a room should be absolutely bare of all but the necessary furniture. The walls and ceilings, if not of hard finish, should be kalsomined several times a year, or, if of hard finish, may be cleaned with cloths moistened in antiseptic solutions (formalin).

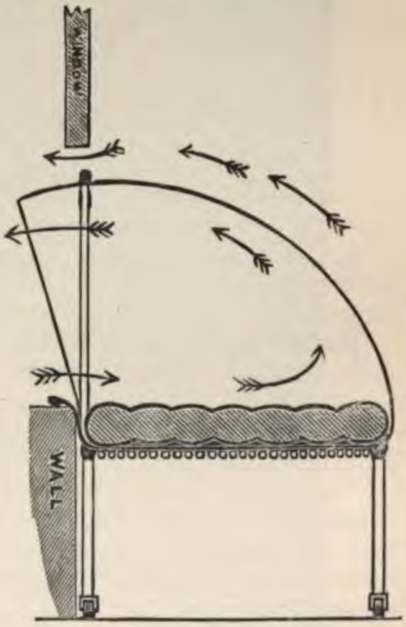

FIG. 148.—CUT OF WINDOW TENT SHOWING VENTILATION.

The underwear should be thin wool, or linen, with warm stockings and sufficient outer garments to keep the patient comfortably warm. A warm cleansing bath is necessary twice a week, and a cold douche at 40° to 60° F. should be taken daily after breakfast.

DIET.—The diet should be liberal as to variety and quantity. The following specimen diet may serve to illustrate what is meant by a liberal diet: Meat, boiled fish, eggs, scraped meat, ham, tongue, oysters, herrings, caviar, sardelles, anchovies, cereals (all kinds), rice, bread, butter, potatoes, green salads, cooked vegetables, soup, milk, buttermilk, matzoon, honey, coffee, chocolate, cocoa, mint tea with tropon, puddings, Roman punch, ice cream, jellies, whiskey, kirsch, wine, extract of malt, beef jelly, champagne, water, mineral water, and ginger ale.

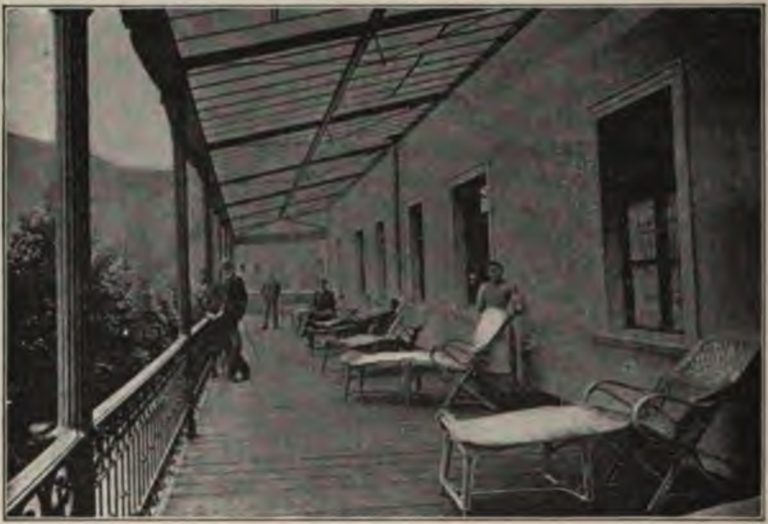

FIG. 149.—OUT DOOR REST CURE. (Dr. S. A. Knopf.)

Fat has a high caloric value and is indicated in wasting diseases, in the shape of sweet butter or emulsion of cod liver oil.

It is best to eat five times a day and not too much at a time. Five drops of dilute hydrochloric acid will aid digestion. The bowels must move at least once a day.

The value of *tent life* in the country or at the seashore in the treatment of tuberculosis is now generally recognized. The results of tent life show that the appetite increases, nutrition improves, cough disappears, night sweats cease, sleep improves, weight increases, the temperature falls, the tendency to "take cold" diminishes, respiration improves, and the pulse rate diminishes.

The construction of a proper tent or cabin for outdoor life can be studied from the cuts.

Specific and Symptomatic Medication.—*Koch's tuberculin* is being used in $\frac{1}{10}$ to 1 milligramme doses in a number of sanatoria, and favorable results are reported by some and denied by others. The writer knows of two individuals who became infected with tuberculosis and are *cured* after a course of tuberculin injections and two years of rigorous hygienic and dietetic management. On the other hand, one of his hospital patients, a girl of six years, afflicted with skin tuberculosis of the ulcerative type, was attacked with tuberculous meningitis four weeks after an injection of one milligramme of tuberculin had given a positive reaction with the temperature above 104°. Inasmuch as tuberculin has been known and used since 1890 in the treatment of tuberculosis, we might reasonably expect a consensus of opinion in its favor if it were a powerful agent for good.

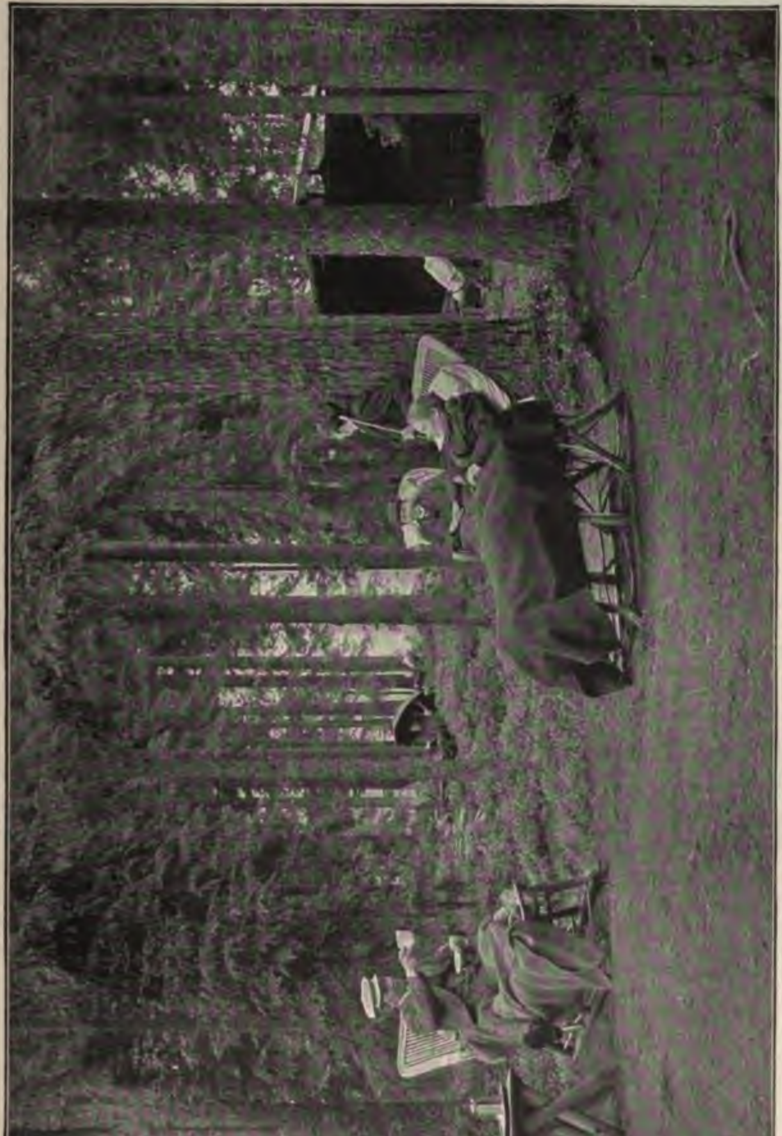

Fig. 150.—Out Door Rest Cure. (Dr. S. A. Knopf.)

Creosote.—Clinical experience is somewhat favorable as regards the power of creosote to check to some extent the spread of tuberculosis in the tissues. The dose is from half a drop to six drops three times a day, in pill form, in milk, or with maltine. In some patients it distinctly upsets the stomach and its use is followed by a feeling of nausea and weakness. Under these circumstances its use should be discontinued. In the incipient stage hygiene, diet, hydrotherapy, and the x ray or sun baths should be employed to the exclusion of drugs. To aid digestion and thus prevent as much as possible intestinal putrefaction, we frequently administer hydrochloric acid and tincture of nux vomica, five drops of each, in water, after a meal, or two drops of ichythol, in a capsule, twice a day, after eating.

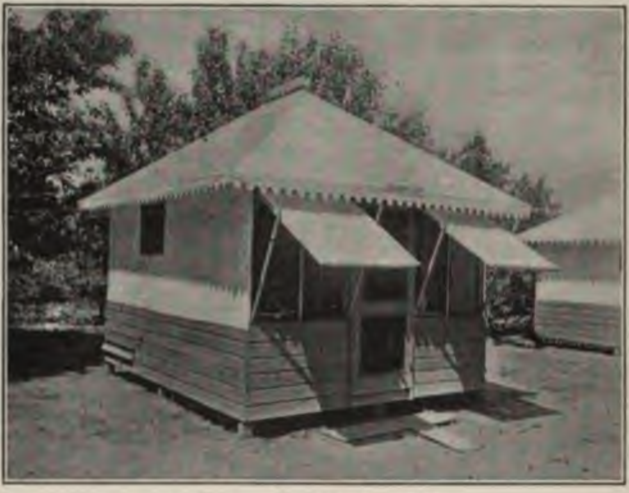

Fig. 151.—The Tucker Tent.

Plans for this tent can be obtained from Charity Organization Society, New York City.

Cough.—A cough is Nature's effort to expel an irritant. This should be explained to the patient. Before resorting to medication to check a cough, the patient should be advised to use the nasopharyngeal toilet, and to endeavor to *inhibit a dry cough by will power.* When the cough is harassing, particularly at night, a dose of morphine (gr. $\frac{1}{4}$) or heroin (gr. $\frac{1}{10}$) may be given; or the following combination:

℞ Acid hydrocyan. dil.,	gtt. xxiv;
Potass. bromid.,	ʒij;
Sol. morph. Magendie,	ʒjss.;
Chloral. hydrat.,	ʒij;
Sp. frumenti,	℥j;
Syr. aurant.,	ad, ℥xij.

M. S.: A tablespoonful when necessary to check cough.

In urgent dyspnœa morphine injections and ozone inhalations give relief.

Pain.—Pain in the chest may often be relieved by applying a hot water bag, a mustard plaster, or dry cups.

Hyperidrosis.—This may be relieved by having the patient rest over night in a coarse linen shirt or short night gown wrung out in cool water with sufficient blanket covering to avoid chilling.

FEVER.—In the management of fever, hydrotherapy should come before drugs. Sponging the body with cool water is preferable to tubbing. When the fever curve is suggestive of malaria, quinine is indicated; otherwise it has no beneficial effect and generally upsets the stomach.

INSOMNIA is always an annoying feature in sickness. Before drugging the patient, it is well to try a cool sponge bath. Should this fail, a glass of strong beer or porter will sometimes produce sleep. In obstinate insomnia drugs must be employed, such as hydrate of chloral and potassium bromide, āā, gr. x to xx; (codeine, gr. $\frac{1}{2}$; urethane, gr. xxx); dionin, gr. $\frac{1}{2}$; trional, gr. xv, in milk; and hyoscine, gr. $\frac{1}{100}$.

The management of hæmorrhage from the lungs and the treatment of genitourinary, intestinal, and laryngeal tuberculosis and other complications is discussed under separate headings, also that of the nervous and mental complications (neuritis, meningitis).

LUNG SURGERY in the early period of cavity formation has a future, particularly when we have the facilities for opening the chest under suction, as with Sauerbruch's apparatus.

BRONCHIAL ASTHMA

Asthma is a term which has been generally applied to various conditions associated with dyspnœa. Thus, we speak of cardiac, renal, gastric, and thymic asthma. The term "asthma" should be employed only in connection with bronchial asthma, which may be defined as a vasomotor turgescence of the bronchial mucosa, although the pathology of the disease is unsettled. The attacks are usually sudden, and probably take their origin in nasal, gastroenteric, renal, or genital reflexes or strong emotions. The disease is often associated with attacks known as "hay fever," or pollen fever. Most sufferers from "asthma" have a neurotic heredity. *Bakers and workers in fur are afflicted more than any other class.* Asthma is a disease of adult life, but is not rare in childhood.

Symptoms.—When seen in an attack, the patient's face appears pale and cyanotic, staring and anxious, or dusky and covered with sweat during the paroxysms. The thorax looks enlarged, barrel-shaped, and fixed, and the diaphragm moves but slightly, with retraction of the intercostal spaces and epigastrium.

Palpation sometimes reveals rhonchial fremitus, vocal fremitus diminished or obscured, the apex beat diffused, and the heart laboring. The heart's impulse may be in the epigastrium. The surface of the body is cold and moist.

Percussion shows marked excess of resonance, especially in chronic cases, extending over the cardiac space and low down to the eleventh rib.

Auscultation reveals inspiration short and quick, expiration greatly prolonged, and low pitched wheezing in both acts. Innumerable faint or loud sibilant, and sonorous, musical, squeaking, and creaking râles, followed by moist cooing sounds, are heard, and the vesicular murmur is nearly inaudible, or of the harsh, cog wheel type. The heart sounds are rapid and feeble.

The *cough* is tight and dry at the beginning of paroxysms, becoming looser in time. *Pain* is usually initial, with a feeling of oppression about the chest. *Dyspnœa* is paroxysmal, periodical, expiratory, generally nocturnal, lasting from a few minutes to hours, and may recur during several nights. *Expectoration* is scanty, hard to expel at first, consisting of rounded gelatinous pellets, Curschmann's spirals; often Charcot-Leyden crystals and eosinophiles, and rarely fibrinous casts. The voice is suppressed during a severe attack.

There is no fever; the pulse is generally quick, small, and irregular during an attack. A sitting or standing posture is usually assumed by the patient. When *bronchopneumonia* sets in as a complication, there is a rise of temperature with a mucopurulent, sometimes blood streaked discharge.

Acute emphysema of the lung is observed in severe attacks, and after *frequent attacks of asthma, chronic emphysema and bronchitis* with enlargement of the heart and congestive conditions in liver, lungs, and kidneys supervene.

The course of the disease is variable. The paroxysms may recur for three or more nights and in the interval during the day there may be wheezing and cough. Death during the attack is almost unknown.

Differential Points.—The dyspnœa of hysteria and the "asthma" of renal and cardiac disease are not attended by the sonorous and piping râles and other physical signs of true asthma. A careful examination will also enable us to distinguish between *true asthma* and *spasm of the glottis, abductor paralysis, œdema of the glottis, bronchial obstruction*, etc.

Treatment of an Acute Attack.—When we are called to a patient suffering from an acute asthmatic attack, prompt relief may be given to adults by means of morphine injected hypodermically (gr. $\frac{1}{4}$ to $\frac{1}{2}$) with or without atropine (gr. $\frac{1}{150}$), or $\frac{1}{4}$ gr. each of morphine sulphate and cocaine hydrochloride. Relief may also be obtained by taking a teaspoonful of the following mixture every hour or two according to the severity of the case:

No. 1

℞ Potass. iodid., ... ʒij;
Liq. ammon. anisati, ... ʒj;
Tinct. opii camphorat., ... ʒij;
Syr. tolut., ... ʒjv;
Aquæ, ...ad, ℥iij.
M.:

or

No. 2

℞ Potass. iodid., ... ʒij;
Morph. sulph., ... gr. j;
Tinct. belladonnæ,
Liq. ammon. anisati, } āā, ... ʒjss.;
Syr. tolut., ...ad, ℥ij.
M. S.: A teaspoonful in water every two or three hours.

Potassium iodide may also be administered per rectum, dissolved in water (gr. xxx), and a dose of chloral (gr. x to xx) may be given by the mouth. The patient may smoke stramonium cigarettes or inhale the fumes of burning stramonium or nitre paper or asthma powder before drowsiness sets in and the patient forgets his misery in sleep.

Powder for asthma, a teaspoonful *to be burned under an improvised tent.*

℞ Powd. saltpetre,	℥j;
Powd. stramonium,	ʒij;
Powd. lobelia,	ʒij;
Powd. belladonna,	ʒij;
Powd. grindelia,	ʒij;
Powd. hydrastis canadensis,	ʒj.

M.:

When dyspnœa is urgent despite these measures, the inhalation of chloroform or chloroform internally often gives relief:

℞ Chloroformi,	ʒj;
Morph. sulph.,	gr. j;
Pulv. gummi arabici,	ʒj;
Syrup.,	ʒjv;
Aquæ,	℥jv.

M., ft. emulsio. S.: A teaspoonful every hour.

In children the potassium iodide mixture No. 1 may be given in one half teaspoonful doses. Sulphate of atropine, gr. $\frac{1}{150}$ to gr. $\frac{1}{100}$ in adults, is used hypodermically to control the attacks. As soon as the acute attack is over, a careful and complete clinical examination must be made *in order to ascertain if possible any underlying cause or source of irritation.* The *nasopharynx* is a *common irritation centre* for asthmatic attacks. Nasal obstruction of whatsoever nature (hypertrophies, polyps, deviations, and spurs) must be removed (see Nasopharynx). Hypertrophic tonsils must be reduced and granulations in the pharynx are to be destroyed. After all this is accomplished, the nasopharynx may be kept clean and moist by means of a saline or albolene spray. Attacks of hay fever and sneezing are to be treated locally with cocaine and suprarenal decoction and with Dunbar's *pollantin* (see Hay Fever). The nasopharynx should be examined several times a year for polyps, which are apt to recur.

The *digestive tract must receive every attention.* The bowels should move once a day (abdominal massage, aloin pills, enemata). Five to ten drops of hydrochloric acid in water may be taken after each meal. Heavy meals are to be avoided because overloading the stomach may bring on an attack, but the diet may be liberal as to variety. Beans, peas, cabbage, pork, mayonnaise, and pastry are to be avoided, including such other articles of diet as are found to disagree. There is no special diet for asthmatics. Alcoholic stimulants may be taken in moderation.

THE UROGENITAL TRACT IN ASTHMA.—After a severe attack of asthma albumin is frequently found in the urine, but it usually disappears when the sufferer is comfortable and the circulation is not embarrassed. Excessive menstrual flow and endometritis may call for curettage. Frequent pregnancies as a rule have an unfavorable influence on asthmatic women by favoring emphysematous changes in the lungs.

NEUROTIC TROUBLE.—The neurotic element in asthma must not be overlooked. Cold sponging or a rest cure with massage and passive exercise is helpful, and all fatiguing social duties are to be laid aside. Mental occupation is desirable for persons apt to become self-centred and morbid. Nearly all cases of asthma show evidences of a psychic element.

Suggestion therapy is decidedly indicated in such cases, and occasionally *hypnotism* is of real benefit. Eye strain, when present, must be corrected. Hygiene of the skin in the shape of baths and friction must not be neglected. Very thin flannel or linen underwear should be worn all the year round, and in cold weather the outer garments should be heavy enough to protect against chill. The feet must be kept warm by means of thick stockings.

CHANGE OF CLIMATE FOR ASTHMATICS.—There are no fixed rules to guide us in suggesting a change of climate for asthmatics, but it is a positive fact that they enjoy a prolonged freedom from attacks in some places and not in others. Some of the writer's patients have done very well in Colorado, New Mexico, southern California, Florida, or the level of the sea at Nantucket and in other maritime districts. A trial sojourn is the only way to settle this question. Under no circumstances should asthmatics be in frequent contact with tuberculous subjects, on account of the special danger of becoming infected. As to the value of the pneumatic cabinet in the treatment of asthma, the writer can state that he has not observed favorable results and does not advise such treatment.

Bronchitis and bronchopneumonia are frequent sequelæ of asthmatic attacks, and will require the treatment which is laid down for such conditions. Asthmatic patients frequently acquire *chronic emphysema,* which is practically incurable and requires symptomatic management.

ACUTE AND CHRONIC PLEURISY

General Remarks

The pleural sacs extend from two to three inches below the lower border of the lungs. This so called *complementary pleural space* extends posteriorly from the ninth to the eleventh rib, and the surfaces of the reflected pleuræ are in contact except when filled with fluid or separated by the border of the lung, which advances and retreats during respiration.

Pleurisy, or inflammation of the pleura, is brought about by infection. Exposure and traumatism are predisposing factors. It may be primary or secondary, unilateral or bilateral. It is often associated with tuberculosis, pneumonia, rheumatism, syphilis, pulmonary infarction, pericarditis, typhoid fever, scarlatina, malarial disease, and other infections or with renal, hepatic, and cancerous disease and arteriosclerosis and gout.

The three principal bacteriological forms of pleurisy are: The tuberculous, the pneumococcic, and the streptococcic.

The onset may be insidious or sudden. Clinically we distinguish the following forms: *Dry pleurisy* (*acute* or *chronic, proliferative* or *calcified*); *effusive pleurisy* (*serous, hæmorrhagic, purulent, chylous, encysted, interlobular,* and *pulsating*); and *diaphragmatic pleurisy* (*which may be dry or wet*).

Dry, Fibrinous, or Plastic Pleurisy

occurs as an independent affection, with pain in the side, slight fever, and friction sounds as symptoms. There may be jerky, cog wheel, or suppressed breathing. As a secondary process, we find it in all inflammatory conditions of the lung, and we suspect its presence whenever a cough is very painful. In *diaphragmatic pleurisy* the pain is usually referred to the region of the liver or stomach, and the friction sounds are heard at the base.

A dry pleurisy is often the first symptom of a tuberculous infection, with friction sounds at the base or apex. After persisting for a short time, the characteristic friction sounds disappear and no exudation takes place. Adhesions between the lung and costal pleura may take place, such adhesions giving rise to crackling friction sounds.

The **prognosis** depends upon the underlying cause. A simple dry pleurisy admits of a favorable prognosis.

Effusive Pleurisy, Wet Pleurisy

This form of pleurisy may come on insidiously and is frequently overlooked. On examining a patient with moderate dyspnœa and accelerated pulse and normal or slightly elevated temperature, we are frequently surprised at finding the chest filled with fluid.

Symptoms.—In other instances the patient complains of a chilly feeling for several days with an early sharp pain in the side. The pulse is quickened and the temperature may be 102° to 104°, its curve not being characteristic. Cough and expectoration may be absent. The breathing may be free or embarrassed. In some instances there are vomiting and delirium. There is no expectoration at first. In the event of an associated pulmonary inflammation, the sputum may be blood streaked or purulent if an empyema or purulent pleurisy has perforated into a bronchus.

Physical Signs.—An effusion is recognized by the physical signs: Dulness on percussion, absence of vocal fremitus, and bulging of the intercostal spaces on deep inspiration. In many instances the *physical signs* are indefinite and a probatory puncture will be necessary to determine the presence or absence of fluid and its character. All these matters are discussed in detail in the section on Pædiatrics. An effusion of more than 400 c.c. in adults or 120 c.c. in children may cause discomfort, but gives no very definite physical signs. When a puncture reveals fluid in the chest, it shows us at the same time its character and enables us to further look into the underlying pathological process by a laboratory examination of the fluid.

Prognosis.—*Acute non-purulent pleurisy* may terminate as such in two or three weeks, with complete restitution to the normal, or may become more or less chronic and finally dry up, leaving *dulness due to adhesions*, or may turn into an *empyema* which requires an operation.

In **serofibrinous pleurisy** the fluid is yellowish and clear or slightly turbid. It may be dark brown, particularly if the fluid is partly inspissated or has been in the pleural cavity a long time. It is rich in albumin and may coagulate spontaneously within and without the thorax. *A coagulated exudate will not pass through an aspirating needle.* Under the microscope the cells pertaining to local inflammation are seen in the exudate. When the fluid in the right thorax is thick and dark brown, it may be of importance to look for liver cells. When the exudate is large, the lung is pushed into the apex, and apical dulness on percussion, with increased fremitus, will be evident. Large exudates displace adjacent organs, and on the right side depress the liver.

Purulent pleurisy, or empyema, may begin abruptly or come on insidiously in the course of other disease, or it may be evolved from a serous pleurisy. Septic symptoms are rarely wanting in purulent pleurisy. For physical signs and termination, see the Pædiatric Section of this book

Hæmorrhagic pleurisy is met with in malignant fevers, cancer, tuberculosis, Bright's disease, and hepatic cirrhosis, and it may be produced artificially by puncture for diagnostic or therapeutic purposes. It is occasionally difficult to distinguish this form from hæmothorax which is the result of rupture of an aneurysm or pressure on the thoracic veins. A sanguineous exudate shows blood clot formation within and without the thorax. *An aspirating needle entering a blood clot would not draw fluid.* When a bloody fluid remains a long time in the thorax, the blood clot becomes disintegrated and dissolved. A puncture made at such a time shows a fluid resembling blood which *does not coagulate on standing.*

Diaphragmatic pleurisy may be dry or wet. In such cases the pain is low down, and the diaphragm appears to be fixed. *Litten's diaphragm phenomenon* is a "visible descending and ascending wave associated with the respiratory movements of the diaphragm in the lower zone of the thorax." It is of very little practical value in diagnosis.

Encysted pleurisy is that condition in which adhesions separate the fluid into pockets, which may or may not communicate with one another. An interlobar encysted pleurisy is sometimes observed.

Chylous pleurisy may result from injury to the thoracic duct, from a parasitic disease called filariasis, or from fatty metamorphosis of the epithelium.

Pulsating pleurisy derives its name from the transmitted pulsations of blood vessels or the heart.

Differential Diagnosis.—The important diagnostic points regarding pleural exudates, and particularly with reference to the conditions found in children, are discussed in Pædiatrics, to which the reader is referred.

Treatment of Dry Pleurisy.—A brisk purge should be given.

℞ Podophyllin.,............................ gr. ⅓;
Calomel, }
Quinin. sulph., } āā,...................... gr. x.
M. S.: One dose. Take in wafer.

Quinine is given to counteract any malarial factor should it be present. Dry cups may be applied over the seat of pain, or a cold compress, an ice bag, or a hot water bag to the chest. Should this fail to give relief, ten grains of sodium salicylate and two grains of potassium iodide may be given every two to three hours, in lemonade. The pain may be so severe as to warrant a hypodermic injection of morphine (gr. ¼ to ⅓) for an adult.

Treatment of Pleurisy with Effusion.—In the beginning the treatment is precisely as in dry pleurisy, but the patient should rest in bed and have liquid diet. When the temperature is high, hydrotherapeutic measures are indicated. As soon as effusion is evident, its nature may be ascertained, and if necessary a probatory puncture should be done, as there are no physical signs which will enable us to distinguish between serous and purulent effusion.

In the absence of severe and septic phenomena, we may assume that the fluid is not purulent, but the needle alone will prove the case. In the event of a purulent or seropurulent fluid, its immediate removal by incision and drainage is indicated. To facilitate drainage a portion of a rib should be resected. A serous fluid should not be removed immediately unless there is a vital indication for so doing. Very urgent dyspnœa which very greatly embarrasses the action of the heart, as in cases in which the fluid reaches to the clavicle, is one of the indications for removing by aspiration all or part of the fluid accumulation. The removal of a few ounces of fluid sometimes appears to start the absorption process.

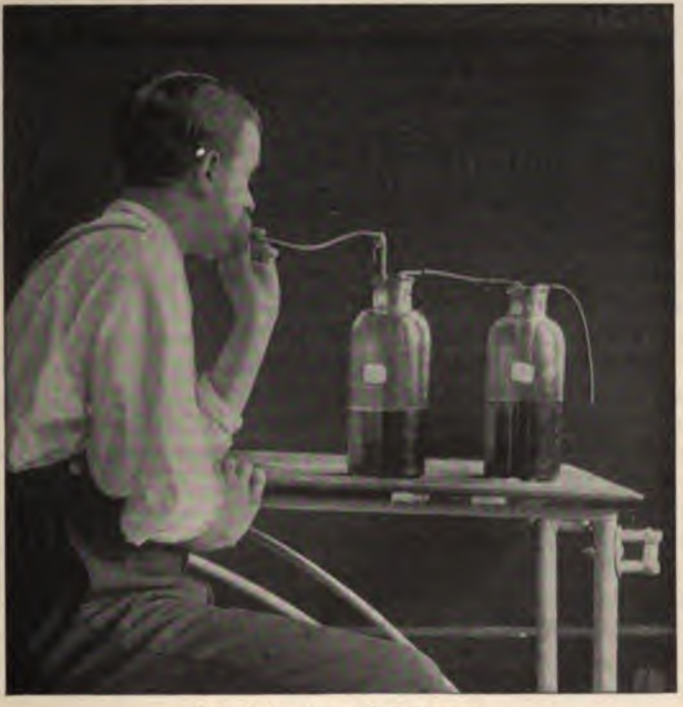

FIG. 152.—LUNG GYMNASTICS.
Blowing a liquid from one bottle into another.

At this stage a somewhat *dry diet* is indicated, and a brisk purge every second day is beneficial. It is also advisable to act upon the skin and kidneys by means of warm baths and enteroclysis at 110° F. Large exudates gradually disappear under such management. In some cases the wearing of a moist compress around the chest, which may be wrung out in cold water and renewed once every two hours, gives great relief. The removal of fluid from the chest is readily accomplished in the manner indicated in the chapter on the Management of Dropsy and Effusion.

After the removal of fluid the patient may practise respiratory gymnastics in the open air or at an open window or blow water from one bottle into another in order to facilitate expansion of the lung.

When fluid reaccumulates to its original height after puncture, it may be removed again. If only a small quantity of fluid reaccumulates, it may be left to Nature. In one of the writer's cases, a very massive pleuritic exudate completely tamponed or checked a recurring and alarming pulmonary hæmorrhage in a girl of sixteen. The patient had repeated hæmorrhages during a period of two weeks, and nothing seemed to check the bleeding. In this case the fluid was purposely not removed; and at the present writing, ten years after the attack of hæmoptysis, the affected chest appears quite free of disease.

Chronic Pleurisy

This may be *dry or wet*. In the dry form massive adhesions and proliferation of connective or fibrous tissue sometimes take place, giving rise to dulness on percussion and marked vocal fremitus. In the *chronic wet form* adhesions and fibrous tissue formation take place and the retained fluid is confined in cystlike pockets. There is more or less flattening of the chest wall. In some instances the newly formed tissue becomes *calcified*, so that a needle introduced for diagnostic purposes will strike hard *calcareous masses*. The thickening of the membranes may compress and invade the lung and induce cirrhotic change. Probably many of the dry and chronic pleurisies are of tuberculous origin.

Chronic pleurisy cannot be influenced by medication or surgery. The management is hygienic and symptomatic. When *arteriosclerosis, chronic pleurisy*, and *cirrhosis of the kidneys* are combined in one individual, the suffering by reason of urgent dyspnœa is very great. Unilateral flushing of the face or dilatation of the pupil has been reported in dry chronic pleurisy as an evidence of irritation of the thoracic ganglion at the apex.

HYDROTHORAX; HÆMOTHORAX; PYOTHORAX; PNEUMOTHORAX

Hydrothorax is a localized dropsy and as such a symptom of cardiac-renal, hæmic, hepatic, and other disease. It may be unilateral, but is generally bilateral. It is distinguished from an effusion by the low specific gravity of the fluid (1.015) and its small percentage of albumin, and by the absence of the usual corpuscular elements of inflammation. It gives rise to the same physical signs and symptoms as pleural effusion, and may disappear spontaneously when the lagging circulation improves, particularly if we aid Nature by a judicious administration of diuretics, purgatives, and diaphoretics or revive an embarrassed heart by venesection. In urgent dyspnœa relief may be afforded by the removal of some of the fluid. The *modus operandi* of thoracocentesis is discussed in the chapter on the Management of Dropsy and Effusions.

Hæmothorax may be due to trauma, leaking aneurysm, ulcerating blood vessels (phthisis), carcinoma, sarcoma, nephritis, scurvy, purpura, pernicious anæmia, leucæmia, or icterus. In marked cases with profuse hæmorrhage we observe all the symptoms of shock—pallor and a feeble, rapid pulse. The physical signs are the same as in serous effusions. An aspiration into the dull area of the chest would reveal blood, *provided the needle did not enter a blood clot.* In hæmothorax of long standing the blood clot is dissolved and the bloody fluid does not coagulate on standing. The *treatment* is symptomatic.

Pyothorax is discussed in detail in the section on Pædiatrics, under Empyema.

Pneumothorax; Hydropneumothorax; Pyopneumothorax. SIGNS.—The physical signs vary according to whether there is open, closed, or valvular pneumothorax.

CAUSES.—The usual causes are perforating chest wounds, neighboring malignant disease, rupture of air vesicles by strain, perforation due to local disease of lung, particularly tuberculosis, pleurobronchial fistula from empyema, and exploratory needle puncture.

GENERAL CHARACTERISTICS.—An anxious, alarmed expression; slight lividity; marked enlargement and immobility of the affected side; bulging of the intercostal spaces (unless offset by a cavity—flat chest); raised shoulder; marked displacement of the apex beat to the opposite side; the patient's usually lying on the affected side; and the respiration sixty or more a minute.

Palpation reveals tactile fremitus greatly diminished or abolished, succussion fremitus if fluid is present, and the liver sometimes greatly displaced downward.

DIFFERENTIAL POINTS.—In large pulmonary cavities the succussion and coin sounds are usually absent, there is no displacement of the heart, liver, or spleen, and there is depression rather than bulging of the intercostal spaces.

A *distended stomach* may cause tympanitic percussion with succussion and metallic tinkling, but a careful local examination together with the history will prevent confusion.

Diaphragmatic hernia and *subphrenic pyopneumothorax* are possibilities to be thought of in obscure cases.

Dulness over a pneumothorax may be mistaken for that of a pleuritic effusion, and a sonorous percussion sound in emphysema may suggest pneumothorax. In both instances succussion sounds, metallic tinkling, and coin sounds are absent.

The *percussion* sound is *amphoric* or *tympanitic* or excessively resonant (rarely muffled, toneless, or *almost dull when the tension is great*) on most of the affected side, with movable dulness; if fluid is present the sound side is overresonant.

Auscultation shows the breath sounds greatly diminished or suppressed (sometimes amphoric if there is open perforation) on the affected side, exaggerated on opposite side, and feebly bronchial near the spine. There may be metallic tinkling on coughing or deep inspiration; a ringing amphoric voice (rarely feeble or absent if the opening is closed); whispering voice transmitted; diathoracic coin sound very clear; a succussion splashing sound if liquid is present; and perhaps a metallic echo to the cardiac sounds. The coin sound is elicited by listening over the back and tapping one coin upon the other over the front of the chest. As air usually enters the pleural cavity during a paroxysm of cough, the pain is sudden and intense, dyspnœa is sudden and urgent, and there are general distress and restlessness with shock and a very rapid and feeble pulse. Exploratory puncture is negative in the air space.

From an analysis of fifty-one cases observed in the Boston City Hospital in eighteen years Dr. J. L. Morse draws the following conclusions:

Summary for Pneumothorax.—Pneumothorax is an uncommon condition. At least 70 per cent, and probably 85 per cent, of the cases of pneumothorax are tuberculous. The prognosis is good when it is due to trauma. It is fair when the pneumothorax is secondary to abscess of the lung. The results of excision of the ribs in these cases are very encouraging. Tuberculous pneumothorax is much more common in men than in women. It is most frequent in the third decade. It is about twice as frequent on the left as on the right side. The onset is acute in rather less than half the cases. Sudden pain and dyspnœa are the most common initial symptoms. The pneumothorax may be the first symptom of tuberculosis noted. Displacement of the heart always occurs, being more marked in the left-sided cases. The pneumothorax is usually complicated by the presence of fluid, but may be simple. Air is rarely present alone in patients living more than a week. The fluid is more often purulent than serous. Recovery from the pneumothorax may occur in about 15 per cent of all cases. The cases which end in recovery are practically all serous. The patients usually die later, however, from pulmonary tuberculosis. The pneumothorax is the direct cause of death in 60 per cent. Eighty per cent of all the patients die in less than a year, and only 10 per cent live over five years. The prognosis is worse in right-sided than in left-sided and in purulent than in serous pneumothorax. It is worse in women than in men. Patients with pneumothorax are sometimes able to be up and about and even to do manual labor.

Treatment.—The general treatment is symptomatic and directed to the underlying cause. Surgical intervention is to be considered in purulent cases and *tapping* in serous effusion.

One of the most remarkable advances of recent date is represented by *Sauerbruch's air chamber,* which eliminates pneumothorax in intrathoracic operations. This is done by excluding the atmospheric pressure during the operative procedure, thus preventing collapsing of the lungs after being opened to the air.

INTRATHORACIC TUMORS AND CYSTS (BENIGN TUMORS; DERMOID AND HYDATID CYSTS; MALIGNANT TUMORS)

Benign tumors, such as *fibromata, lipomata, chondromata,* and *osteomata,* give no characteristic symptoms, and inasmuch as the thorax is not as yet a field for exploratory incision they present more of a pathological than clinical interest. In all obscure intrathoracic affections the possibility of a syphilitic lesion should not be overlooked and an antisyphilitic regimen adopted in all *doubtful cases*.

Dermoid and hydatid cysts within the thorax are rarely encountered. They give rise to obscure pressure symptoms with local irritation. A diagnosis of such conditions might be arrived at by an examination of cyst contents obtained through puncture and aspiration.

Malignant tumors of the lung and pleura are observed in middle and advanced life, rarely in children, and may be jointly discussed from a clinical standpoint. Cough and expectoration, pain, pressure symptoms, enlarged lymph nodes, and cachexia are the "group symptoms" of this class of lesions, and prolonged observation is often necessary to establish a diagnosis. An absolutely positive diagnosis of malignant tumor of the lung and pleura involves a microscopical demonstration of expectorated tumor elements.

Carcinoma of the pleura gives the evidence of chronic pleurisy with and without effusion. Pain and cachexia are marked. Primary malignant new growths of the pleura are rare; they occur more frequently than otherwise in connection with carcinoma of adjoining viscera and mammary gland. Pleural exudates in connection with malignant growths are amber colored or sanguineous. When a pleural exudate is bloody and tuberculosis can be excluded, we have good grounds for suspecting a tumor in elderly individuals.

Malignant new growths in the lung are primary or secondary by contiguity and metastasis, and the associated lesions are enlargement of glands and pleural exudates.

SYMPTOMS.—Pain may be mild or severe. Fever may be absent. When it is present the temperature curve is not typical. Dyspnœa is an important and constant symptom, and may be paroxysmal. Cough, dry or moist, is present in most cases. The sputum may be mucous, purulent, sanguineous, prune juice colored, or fœtid. A prune juice sputum by itself is not characteristic of cancer, but in conjunction with other symptoms it becomes significant. Pressure symptoms of some kind are invariably present. They include dysphagia (from pressure on the œsophagus), hoarseness and aphonia (from pressure on the recurrent laryngeal nerve), dyspnœa (from pressure on the trachea and bronchus)—an important and constant symptom which may be paroxysmal, and distention of veins and unilateral œdema of the face and neck.

The rational physical signs are dulness or flatness on *percussion* and diminished vocal fremitus. On *auscultation* we notice friction sounds, weak breathing sounds, and rhonchi, unilateral or bilateral.

PROGNOSIS.—The disease ends fatally with an *average* duration of six to eight months.

DIFFERENTIAL POINTS BETWEEN ANEURYSM AND TUMOR.—In tumor we miss the tracheal tugging and the accentuated aortic second sound, and there is no difference in the radial pulse. A tumor may pulsate, but the expansile character of the pulsation is absent, as also the diastolic shock of the heart sounds. In malignant tumor there is much pain, the cervical and axillary glands are enlarged, and cachexia is marked. An x ray examination will be helpful in the diagnosis of such conditions. To distinguish between tumor and encapsulated pleuritic effusion, an exploratory puncture may be done.

A chronic indurated fibrous condition of tuberculous or non-tuberculous or syphilitic origin may simulate tumor. A lengthy observation, during which time a mercurial inunction course may be carried out, will be necessary to come to a definite conclusion.

Treatment.—In the present state of our knowledge we have no cure for malignant tumors which cannot be radically removed. In all cases the patient should have mercurial treatment. Exposure to x rays or radium may be tried as a therapeutic agent. When the dyspnœa is urgent, pleuritic effusion if present must be removed as often as necessary. Morphine relieves pain and dyspnœa.

AFFECTIONS OF THE MEDIASTINUM

Fibrous Mediastinitis.—The mediastinum may participate in the acute and chronic adhesive and proliferative inflammation of the pleura or pericardium, and at autopsies we occasionally recognize a fibrous mediastinitis or a gelatinous exudate.

Emphysema of the mediastinum is associated with pneumothorax, or may be due to injury (tracheotomy with division of the deep fascia).

Mediastinal lymphadenitis may result from all causes which may produce lymph node induration elsewhere. Suppurating glands may discharge into a bronchus or into the œsophagus or perforate into a large blood vessel.

Mediastinal abscess occurs secondarily to spinal caries, syphilis, tuberculosis, septic infection, traumatism, suppurating lymph nodes, etc. In addition to the general symptoms of sepsis (fever, chills, and sweats), there may be pressure symptoms, such as dysphagia, dyspnœa, a husky voice, aphonia, and a sense of weight or pain behind the sternum or between the shoulders. When a palpable swelling with superficial œdema is noticeable, an exploratory puncture is indicated. Most abscesses are situated in the anterior mediastinum, and when detected should be evacuated and drained.

Enlarged Thymus Gland.—This condition is found occasionally in infants and may be suspected by reason of an abnormal substernal percussion dulness (see section on Pædiatrics and diseases of the ductless glands).

Mediastinal tumors are situated in the upper half of the chest. Wherever we elicit a substernal percussion dulness, and there are in addition pain, cough, and pressure symptoms, we shall have to distinguish between tumor, aneurysm, abscess, and a syphilitic gumma.

The *diastolic* shock and *expansile pulsation* of aneurysm are absent in tumors. After excluding aneurysm, we give the patient the benefit of the doubt and direct an inunction course. Marked cachexia and an enlargement of glands speak for malignant tumors. Fever, chill, and sweats speak for pus. A *systolic* shock and pulsation may be transmitted to tumors and abscesses from underlying vessels.

Treatment.—The treatment of all such conditions is symptomatic, except in syphilitic lesions, when it is specific with mercury and potassium iodide. Malignant tumors rarely have a duration of more than eighteen months. X ray treatment may be tried in such cases.

CHAPTER XVII

THE GENITOURINARY SYSTEM

DISEASES OF THE GENITOURINARY ORGANS

SYNOPSIS: Remarks on the Clinical Pathology of the Urinary Tract.—Hæmaturia, Hæmoglobinuria, Albuminuria, Pyuria.—Polyuria, Oliguria, Calculi, etc.—Remarks on Urination, Catheterism, Vesical Emergencies.—Remarks on Renal Insufficiency and Newer Methods of Diagnosis.—Diseases of the Kidneys.—Congestion, Acute and Chronic Nephritis.—Surgical Treatment of Nephritis.—Uræmia and its Treatment.—Pyelitis, Pyelonephritis, Pyonephrosis, Surgical Kidney.—Perinephritic Abscess.—Movable and Floating Kidney.—Diseases of the Ureters.—Ailments of the Bladder.—Extroversion, Diverticula.—Vesical Hypertrophy.—Vesical Neuroses and Paralyses.—Acute and Chronic Cystitis.—Ulcerative Cystitis, Pericystitis.—Stone in the Genitourinary Tract.—Syphilis of the Genitourinary Tract.—Tuberculosis of the Genitourinary Tract.—Benign and Malignant New Growths of the Genitourinary Tract.—Parasites of the Genitourinary Tract.—Localized and Minor Ailments of the Male Generative Organs. (Continued in following Section.)

REMARKS ON THE CLINICAL PATHOLOGY OF THE GENITOURINARY TRACT

The pathology of the genitourinary tract includes congenital defects, traumatism and its sequelæ, infection, and parasitic invasion. The genitourinary tract is frequently the seat of benign and malignant new growths or of concretions and foreign bodies. Kinking and compression of the ureters may give rise to retention phenomena, and the kidney may become loose in its attachment, and such displacement may be followed by various diseased conditions or reflex symptoms. Pregnancy occasionally gives rise to disturbances in the genitourinary tract, and functional derangements are very common.

Infection of the genitourinary tract may occur in various ways. Microorganisms in the circulation may pass out through the kidneys and leave them intact. Infection of one segment of the urinary organs may spread upward or downward to other segments and to adjoining tissues, as in tuberculosis and gonorrhœa of the genitourinary tract.

Primary disease of a calyx may infect the *bladder* through the agency of the *ureters* and spread to the *pelvic contents*. Primary disease of the *kidneys* (tuberculosis) may infect all the lower urinary organs. Infection of the bladder may take place through the urethra, naturally or by catheter. *Stagnation of urine*, in consequence of stricture, paralysis, or a hypertrophic prostate, may result in *back pressure* and in *ammoniacal fermentation* with the production of sulphuretted hydrogen, which may become absorbed and act as a systemic poison or irritate the mucous membranes locally. *Urinary concrements* (*stones*) may form anywhere, composed of *urates*, *uric acid*, *oxalate of calcium*, or *earthy salts* joined by *mucous* or *albuminous substances*. *Uric acid concrements* are found in the kidney even in the new-born. The pathology of the uric acid diathesis will be discussed under Gout. Regarding *oxalic concrements* and those of *cystine* and *xanthin* we have no definite knowledge. *Phosphatic concrements* are apt to form when the urine becomes alkaline.

Pain is a prominent symptom of most genitourinary troubles and when present is a valuable guide as to the locality of an ailment, *particularly as to which side is affected.*

Waste products in the blood are eliminated in the urine, and all substances which the kidneys secrete are in solution in the urine; therefore the condition of the urine depends largely upon the condition of the kidneys and of the blood flowing through them. The total **solids** in the urine vary from 3 to 12 per cent, and the quantity of *urea* secreted is in direct proportion to the quantity of blood passing through the kidneys and in conformity with the food ingested.

The **quantity of water** secreted is dependent on its supply and on the blood pressure and the state of the capillaries in the kidneys. Thus, in cardiac disease with simple albuminuria *we can rely upon the diuretic action of digitalis so long as the kidney epithelia are not completely degenerated.* All drugs which increase arterial pressure are diuretics, as also are a number of easily diffusible salts.

Normal blood pressure with vasomotor dilatation of the kidney capillaries is the probable explanation of **polyuria.** The relation of the heart and kidneys is very intimate. A weak left ventricle with low arterial pressure reduces the urine in quantity. Venous pressure in the kidney may become increased by inertia of the right ventricle or from local causes in the kidney itself.

A general acute inflammation of the kidney or inertia of both sides of the heart, with low arterial and high venous pressure, as in heart disease, reduces the secretion of urine to a minimum. Finally, a decrease of urine is observed when there is *vasomotor constriction* in which the kidneys also participate, as in *asphyxia*, *strychnine poisoning*, and *epileptic and eclamptic seizures*. When the secreting epithelia suffer transitory or permanent changes, albumin shows in the urine.

The urine is diminished (concentrated) when quantities of water leave the body by other routes, as in sweating, diarrhœa, etc., and the quantity of urine secreted will vary according to the degree of the change in one or both kidneys. The lumen of the uriniferous tubules is gradually diminished and obliterated by a local inflammatory process. When the resistance is equivalent to 60 mm. of mercury the secretion of urine ceases, but before this takes place the kidney becomes œdematous (hydronephrotic and finally atrophic). When the ureters are periodically occluded, the kidney parenchyma suffers but little, and large hydronephrotic sacs are formed by dilatation of the calices. Thus, clinically, we observe kidney lesions secondary to various diseases, also primary, such as acute and chronic parenchymatous degeneration by reason of infection and irritation. Ultimately complete atrophy and retraction occur, with total abeyance or loss of function.

The average daily amount of urine passed by an adult is from 33 to 40 ounces, and in the case of a child, its age in years, *doubled*, will approximately give the number of ounces per diem. The urine increases in quantity as the individual takes large quantities of fluids; it decreases on diminished consumption of fluids or loss of fluid by perspiration and diarrhœa.

Polyuria is found in neurotic individuals and in true diabetes, also in chronic interstitial nephritis and in other conditions. The urine varies in color and has a specific gravity of about 1.020. The normal average daily quantity of urea excreted by an adult amounts to about 16 to 30 grammes (a little more than an ounce). A clear insight into the diseased conditions of a patient is impossible without a knowledge and examination of the urine. We investigate its specific gravity and look for albumin, sugar, bile, blood, pus, casts, etc. Hyaline casts may be found in almost any febrile condition and are not of grave import. In children, a severe nephritis with a smoky, bloody, and scanty urine showing albumin and blood casts may end in complete recovery if the heart remains intact. In gastroenteritis of long standing albuminuria and nephritis are often found as a complication, also in malarial disease. In tuberculosis of the genitourinary tract the bacilli are not often found in the urine. Pus and blood in the urine may take their origin from any region of the genitourinary tract and from perforation of a neighboring abscess into the bladder. The urine of one kidney may be collected separately by means of a catheter passed into the ureter by the aid of the cystoscope. Retention and suppression of urine are readily distinguished. Incontinence, slow urination, and frequent urination may be of central or local origin. Convulsive substances (paraxanthin and acetone) are found in the urine after attacks of eclampsia. Urine may be preserved for a long time by adding to it a few drops of chloroform.

Systemic Poisoning from Kidney Insufficiency

The kidneys act as guardians and eliminators to the blood, and a diminution of their function will result in an abnormal condition of the blood. Uræmia with somnolence, convulsive seizures, vomiting, blindness, paralysis, and disturbances of the heart and respiratory function, with or without fever, are due to kidney insufficiency. We look upon such phenomena as an evidence of systemic poisoning (for urea, uric acid, potassium salts, and kreatin are nerve poisons), but we are unable to explain why in certain instances anuria of several days may persist without uræmic symptoms. The diseased kidney itself throws poisonous substances (hypoxanthin and acetone) into the circulation, which thus irritate the vital and motor centres. Many experiments regarding the toxicity of urine have been made without any definite results.

REMARKS ON ALBUMINURIA

In the healthy individual the urine is supposed to be free of serum albumin and sugar. When large quantities of urine are manipulated and very delicate reagents are applied, both these substances are found in minute quantities. In some instances albumin is found occasionally in the urine of adults or children who are apparently in good health. The terms physiological, cyclical, accidental, and transient albuminuria have been coined for such cases. Albumin is found in the urine of individuals during or after great muscular fatigue, such as results from the forced marches of soldiers and in the case of athletes. Albumin is also found in the urine after eating eggs, etc. In such cases of transient albuminuria the afternoon urine is usually free. Anæmic children about the time of puberty may show transient albuminuria. As to the relative significance of *nucleoalbumin* and *serum albumin,* we have no definite knowledge. The important part is *the relation of albuminuria to nephritis.* The observations of G. M. Edebohls, of New York, who, in dislocated kidney with axis torsion of the ureter, has found albuminuria to disappear after fixation of the kidney, and who has recently advocated kidney decapsulation in otherwise incurable cases of chronic Bright's disease, are *of fundamental importance regarding the clinical pathology of nephritis.* At any rate it appears almost certain that there may exist albuminuria from local circulatory disturbances not connected with lesions of the kidney epithelia.

Kidney epithelium is damaged in various ways: By microbial infection of all kinds, the action of toxines and metallic poisons, also cholæmia, closure of the renal artery, and circulatory disturbances in general. Clinically, it is well established that exposure to intense cold may be followed by inflammation of the kidney, but we do not understand thoroughly the causal nexus between skin and kidney lesions.

In all of the instances cited above the albumin and globulin come from the blood (serum albumin). Those rare instances in which globulin is found alone (as in measles) are not cleared up. The intensity and extent of the epithelial degeneration are in many cases in direct proportion to the albumin found in the urine, but the quantity of urine excreted is no guide to the amount of albumin wasted.

HÆMATURIA

In slight hæmaturia the microscope will detect the blood cells. In severe hæmaturia the color of the urine is reddish brown or black, and the blood may clot. (See also Laboratory Aids to Diagnosis.)

The **causative factors** are injury (stone, foreign bodies, instruments), congestion or inflammation anywhere in the genitourinary tract, in infectious diseases. Additional causes are hæmophilia, purpura, scurvy, renal infarction, simple ulcer, carcinosis, tuberculosis, syphilis of the genitourinary tract, ruptured veins, parasites, and poisoning by cantharides, turpentine, carbolic acid, potassium chlorate, etc. Idiopathic, or congenital, hereditary, and family hæmaturia has been reported. In order to make sure that the urine has not been contaminated by menstrual blood, it should be removed with a catheter.

Regarding the source of the blood and the cause of the bleeding, much information may be elicited by a careful inquiry into the previous history of the patient. Thus, stone, tuberculosis, acute kidney infection, and sarcomatous degeneration are found in early life. Stone, stricture, cancer, and prostatic disease are more common in adults and in old people.

In kidney tumors the kidney is enlarged and tender, the blood is intimately mixed with the urine, and rest has but little influence on the amount of blood.

In **stone in the kidney** the general condition is usually good until a suppurative process is established in the kidney. The pain may be very severe, with a rise of temperature, simulating that of appendicitis when it is located on the right side. The bleeding is rarely profuse and is relieved by rest. The blood is intimately mixed with the urine.

In **tuberculosis of the kidney** the blood is intimately mixed with the urine and the amount is slight. The pain is not of a colicky nature, the general health suffers, and pus is found in the urine at the same time, and also tubercle bacilli.

Benign villous papillomata may provoke hæmaturia. Such a condition can be recognized only by an exploratory operation.

In **tumor of the bladder** the pain is not severe, the bleeding is intermittent, and the blood generally appears at the end of urination.

In **stone in the bladder,** urination is frequent and arrested involuntarily; pain in the glans is complained of after urination and blood appears at the end of the act.

In **tuberculosis of the bladder** the symptoms are those of cystitis. The pain usually ceases after urination. The blood is bright and appears suddenly.

Prostatic disease sets in usually after middle age. The frequency of urination is increased without much pain. Blood may show at the beginning or end of urination. Attention has been called to hæmaturia from healthy kidneys as the result of overexertion, in one case from horseback riding, in another from the bicycle. Such causes must be borne in mind. These forms of hæmaturia are not attended with enlargement of the kidneys. They do, however, present sensitiveness on percussion, and the urine contains rouleaux of red blood corpuscles or bloody cylinders, but no casts. General symptoms of neurasthenia support the diagnosis.

In doubtful cases an examination with the cystoscope, ureteral catheter, Harris's segregator, Luy's apparatus, or the x rays may be necessary for the diagnosis, or an exploratory incision may be justified. Regarding the use of the ureteral catheter, it may be said that the greatest care should be taken to avoid injury.

HÆMOGLOBINURIA

Hæmoglobinuria is that condition in which *blood pigment* appears in the urine. The paroxysmal form is characterized by chills and heat, various paræsthesias and pain, and a Burgundy red urine containing serum albumin, oxyhæmoglobin, methæmoglobin, and a few erythrocytes. Enlargement of liver and spleen, jaundice, and a feeling of anxiety are present. After an attack which may last for a few hours the stools are black. The causation is unknown. Malaria, syphilis, and severe muscular exertion are looked upon as causes, also exposure to cold. Between attacks the patients are well, although some have albuminuria and in some cases attacks of albuminuria and hæmoglobinuria alternate. The kidney epithelia may suffer from hæmoglobinuria, and complete anuria result.

PYURIA; PUS IN THE URINE

Pyuria is a very important symptom in disease of the urinary tract. It may occur from rupture of a neighboring pus deposit. When pus is found in the urine, the question arises as to its source. A large amount of pus usually comes from an inflamed bladder or from rupture of a pus sac into some part of the urinary canal. Urine with pus from the kidney is usually acid; urine with pus from the bladder is usually alkaline. In pyuria due to disease of the urethra the urine first voided will contain pus, while the succeeding portion is clear (two glass test). Pyuria due to disease of the ureters (tuberculosis, stricture, calculus) may possibly be determined by ureteral catheterism or by means of the Harris segregator.

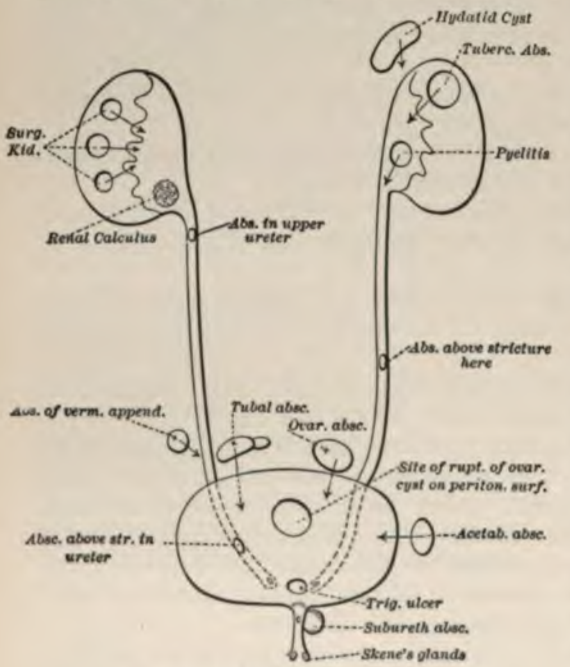

Fig. 153.—Sources of Pyuria.
(Medical News, 1897.)

The continuous or intermittent presence of pus in acid urine suggests tuberculous, calculous, or obstructive pyelitis, or surgical kidney. Ureteral catheterism, the Harris segregator, Luy's apparatus, or an exploratory inspection of a painful and enlarged kidney may be necessary to determine the affected side.

Outside sources of pus (pyosalpinx, suppurating pelvic cysts, and appendicular abscess) are made out by bimanual palpation. A bacteriological examination of the pus may reveal a number of specific microorganisms.

POLYURIA, OLIGURIA, AND ANURIA

Normal blood pressure with vasomotor dilatation of the blood vessels in the kidney is the probable explanation of **polyuria,** which is observed in chronic interstitial nephritis, in neurasthenia, in organic central nervous disease, during the absorption of large effusions, and in chronic diabetes. The term *diabetes insipidus* has been used in connection with polyuria. This term is misleading and apt to alarm the patient; consequently it should be abolished.

Oliguria (diminished quantity of urine) is an evidence of low blood pressure. It is found in all severe fevers and in cases of weak heart, chronic parenchymatous nephritis, or great loss of the fluids of the body. Scanty urine, furthermore, occurs in occlusion of the ureter, in hysteria, and in lead intoxication. Anuria may be obstructive or non-obstructive (reflex).

CALCULI

Urinary concrements may form in any part of the urinary tract. They are composed of urates, uric acid, oxalate of calcium, or earthy salts held together by means of albuminous substances. *Uric acid concrements* are formed in the kidney even in infants. The pathology of the uric acid diathesis will be discussed under Gout. Regarding *oxalic, cystine, and xanthin concrements* we have no definite knowledge. *Phosphatic concrements* are liable to form when the urine becomes alkaline. Pain is a prominent symptom of genitourinary troubles due to calculi.

It is of great practical importance to know that chronic nephritis is often a *unilateral disease,* and that a typical renal colic may accompany an acute exacerbation of any inflammatory process in the kidney *without the presence of renal calculi,* a pain in such cases being probably due to distention of a resisting capsule.

Mellituria, acetonuria, indicanuria, phosphaturia, lithuria, oxaluria, cystinuria, melanuria, mucous casts, microorganisms, and other pathological conditions of the urine, including the diazo reaction, are discussed under Uranalysis in the chapter on Laboratory Diagnosis.

REMARKS ON URINATION, CATHETERISM, AND VESICAL EMERGENCIES

Dysuria and **strangury** are terms used to designate spasmodic and painful urination, and vesical tenesmus is often associated therewith. Irritating qualities of the urine, disorders of the bladder, the urethra, or the prostate gland, in women disease of the pelvic organs, and all inflammatory conditions of the lower intestine are the usual causative factors of dysuria.

Difficult, slow, or **interrupted urination** is usually due to an obstruction in the urinary passages or to atony of the bladder and overdistention of this organ. Frequent micturition may be due to local irritation in the genitourinary tract, as to stone or to chronic cystitis, to undue local treatment or to a purely neurotic state, with or without local irritation. The frequent dribbling of urine due to overdistention is readily recognized by an unusually large bladder dulness on percussion.

Incontinence is the inability to prevent the escape of urine, as in paralysis of the sphincter muscle of the bladder. It is one of the important symptoms in disease of the brain and spinal cord and in the so called typhoid state, but it is frequently a purely functional disturbance observed in neurotic individuals. An undue contraction of the detrusor muscles is also supposed to be the cause of incontinence. In fat women the mere act of coughing may produce incontinence, particularly when it is favored by mechanical conditions resulting from pelvic or perineal ailments. Some persons acquire the habit of urinating frequently because they have not far to go to the toilet room.

Retention of urine may be due to brain and spinal cord disease, to the typhoid state, to paralysis of the abdomen, as in peritonitis, to mechanical obstruction from an enlarged prostate or stone, or to simple hysteria Retention of urine is one of the important vesical emergencies which must be overcome by catheterism, and in the event of its failure, by suprapubic aspiration or by perineal incision. In catheterizing, the catheter and the hands of the operator must be thoroughly clean. The urethral orifice and its immediate neighborhood should be carefully wiped with a pledget of cotton saturated with a non-irritating antiseptic water (1 to 2,000 bichloride of mercury solution or a 2 per cent formalin solution). In catheterizing no force must be used, for fear of creating a false passage.

The following kinds of catheters are in use: Soft gum catheters and silk woven gum elastic catheters, blunt and olivary pointed and flat. When an olivary catheter cannot be introduced, we may employ a whalebone filiform bougie, over which a Gouley tunneled catheter may be slipped. In some cases with prostatic hypertrophy we succeed best in entering the bladder by means of a Mercier catheter with a short beak. The ordinary *silver catheter* has a larger prostatic curve.

Suppression of urine, or **anuria,** is a term used to designate the condition in which the urine does not reach the bladder. This can be established by catheterism. Total suppression is rarely observed; even in serious disease a small quantity of urine is usually secreted. It is found in disease of the kidney or in cases in which blood pressure is very much lowered or when the fluids of the body are lost in large quantities (choleraic diarrhœa). It is occasionally met with in neurotic women and children. There is also an obstructive suppression, in which case both ureters are *occluded* by an inside or outside obstruction, or the ureter of a healthy kidney may be kinked or obstructed and complete suppression result because of disease of the other kidney.

REMARKS ON RENAL SUFFICIENCY AND NEWER AIDS TO DIAGNOSIS

The condition of renal permeability remains the principal prognostic indicator, no matter what the anatomico clinical type of the renal lesion may be. We have various methods of estimating renal sufficiency: First, the estimation of the amount of urea secreted; second, the phloridzin test; third, cystoscopy and segregation of the urines; fourth, cryoscopy of the urine and blood.

In renal insufficiency the excretion of urea is below the normal, and it is important therefore to know how much urea is secreted in twenty-four hours in a given case. The *modus operandi* of this test will be found in the chapter on Laboratory Examinations. The phloridzin test consists briefly in injecting sterilized phloridzin subcutaneously, the urinary bladder having been previously emptied, and testing the urine for sugar half an hour after the injection; the test is again made at the end of the second half hour. Experiments have shown that the elimination is much greater in the normal than in the diseased kidney. Experiments made with urine taken from patients under ether have shown the renal function stimulated by the anæsthetic, if the kidneys are normal, but this is not true if the kidneys are diseased.

CYSTOSCOPY, URETERAL CATHETERISM, AND CRYOSCOPY

The **cystoscope** enables us to inspect the interior of the bladder and to insert a catheter into first one and then the other of the ureters, and thus draw off the urine from each kidney separately.

Cryoscopy is, in brief, the determination of the freezing point of fluids containing substances in solution, and it is applied to the diagnosis and prognosis of cardiac and renal diseases. The freezing point of normal blood is 0.56° C. In renal insufficiency the freezing point is lower and falls with the accumulation of solid material in the blood. This test is made prior to a contemplated nephrectomy. A freezing point of 0.58° C. does not contraindicate an operation. A freezing point of 0.59° C. demands caution. A freezing point of 0.60° C. is a positive contraindication to any operative interference on the kidney, according to Dr. Kümmel, of Hamburg, who has applied this test in 265 cases. The *modus operandi* of cryoscopy is described in the section on Clinical Laboratory Work.

All these tests should be regarded as aids to diagnosis, and they are not to take the place of other well established clinical methods. Cystoscopy is not difficult to practise, but cannot be learned from a book.

DISEASES OF THE KIDNEYS

GENERAL REMARKS ON DIAGNOSIS

The kidneys lie against the posterior abdominal wall, one on each side of the spinal column. The upper end of one is in contact with the liver and that of the other with the spleen.

Bimanual palpation of the lower border of the normal kidney is possible in a subject with a lax and thin abdomen, in the recumbent or standing position. Abnormal mobility, enlargement, and tenderness are readily detected if they are present. Percussion gives uncertain results.

When a diagnosis cannot be made by bimanual palpation and uranalysis, with due consideration of the symptoms, we may employ the aspirating needle or make an x ray examination. It is also possible to gather urine from each kidney separately by means of the Harris segregator and ureter catheterism, and in very obscure cases an exploratory incision is justifiable, particularly when one kidney is to be removed and we wish to be sure regarding the functional condition of the other kidney. In catheterism of the ureters the possibility of infecting or injuring those tubes is always to be borne in mind. An exploratory incision may be a safer procedure than ureteral catheterism.

For a careful analysis the entire amount of urine passed in twenty-four hours is necessary. The urine of infants may be collected by means of a wide mouthed bottle strapped over the genitals. To prevent contamination by vulvovaginal discharges, the urine may be taken by catheter.

CONGESTION OF THE KIDNEYS; HYPERÆMIA OF THE KIDNEYS; RUPTURE OF KIDNEY

The disease may be acute, as in the early stages of acute infectious disease. The passive, or mechanical, congestion is usually due to cardiac, pulmonary, or hepatic ailments and obstruction, or it may be due to the pressure of ascites, that of tumors, or that of the gravid uterus. Malposition and displacement of the kidneys may account for their congested condition.

Symptoms.—The symptoms of kidney stasis are indefinite; the urine in such cases contains albumin and hyaline casts.

Treatment.—When kidney congestion is suspected, the patient should have a full dose of calomel or blue mass (5 to 10 grains), followed by a saline cathartic. Enteroclysis and warm baths should be ordered. The diet should be restricted in conformity with the diet rules for the underlying diseases.

Subcutaneous rupture of the kidney from traumatism may be managed by rest and expectant treatment or by operative measures according to the nature of the case.

REMARKS ON ACUTE AND CHRONIC NEPHRITIS (BRIGHT'S DISEASE)

Inflammation and degeneration of the kidney structure are brought about by traumatism and infection, toxic irritation, and arteriosclerotic changes. Chronic gastrointestinal indigestion, chronic malarial disease, syphilis, and chronic alcoholism will affect the kidneys in the same way as they affect other glandular organs. The injury to the kidney may be of a temporary nature and pass off completely; in such instance we speak of *acute nephritis*. When the kidney is permanently damaged, there is chronic nephritis, which ends in complete insufficiency of this organ. At the bedside we recognize an acute and a chronic Bright's disease, and clinically we may make a distinction between chronic parenchymatous and chronic interstitial nephritis (cirrhosis). All other distinctions, that of the amyloid kidney, for instance, are of pathological import only, and should be relegated to the dead house.

ACUTE NEPHRITIS

Acute Bright's disease occurs in connection with exposure to cold or extensive burns of the skin and in connection with all acute infectious diseases, particularly scarlatina, measles, and cholera infantum, and it may be due to the toxic irritation of turpentine, potassium chlorate, cantharides, carbolic acid, etc.

Symptoms.—The urine becomes scanty and high colored or smoky in appearance, and is found to contain blood, albumin, and epithelial and blood casts. The fever is variable. There is a hard pulse. The face and ankles may be puffy and swollen. There may be general œdema or a localized œdema of the glottis and the lungs. Uræmic symptoms, coma and convulsions, are not uncommon, and as regards severity all grades are encountered.

Prognosis.—The outlook varies with the underlying cause. In children the most severe forms of nephritis may end in complete recovery; in some instances a kidney will clear up in two weeks, or it may take several months before the symptoms completely subside. A rapidly fatal form is occasionally encountered.

Treatment.—The patient suffering from nephritis, whether primary or secondary, should rest in bed and have his bowels moved by calomel and a saline cathartic.

Diet.—Water, milk, slimy gruel, beef tea, peppermint tea, black tea, chicken broth, matzoon, buttermilk, arrowroot, cornstarch and custard, ice cream, and alkaline mineral waters may be allowed.

Enteroclysis at 110° F. should be practised once or twice a day to stimulate the kidney secretion. When there is pronounced kidney insufficiency, we call upon the *skin and the bowels to perform eliminative work.* The skin is influenced by means of hot tub baths, hot air baths, and the hot pack; the bowels may be made to move by the administration of saline cathartics, such as sulphate of sodium. Should the skin remain hot and dry, from $\frac{1}{8}$ to $\frac{1}{12}$ of a grain of *pilocarpine* may be given three or four times a day to children, and double this dose to adults. Infusion of *digitalis*, in teaspoonful and tablespoonful doses, will increase the kidney secretion by increasing arterial pressure. If the heart is very much embarrassed, *venesection* should be done, and when there is complete suppression of urine the kidneys should be exposed by a *lumbar incision* and renal tension overcome by splitting the kidney capsule.

CHRONIC NEPHRITIS (CHRONIC BRIGHT'S DISEASE)

Clinically, we are able to recognize two forms: Chronic diffuse nephritis (parenchymatous nephritis) and interstitial nephritis (cirrhosis).

Chronic Parenchymatous Nephritis

This form corresponds somewhat to the hypertrophic cirrhosis of the liver. Such a kidney, when seen *in vivo*, is very large, reddish blue in color, and has a thin capsule which can easily be stripped off. *Post mortem* such a kidney is large and has a whitish appearance, but occasionally it appears small and white. It is met with in young adults and in children, following infectious diseases or acute nephritis from the various causes already enumerated.

Symptoms.—The cardinal symptoms are *dropsy*, *anæmia*, and *urinary changes*, and associated with them may be *headache*, *nausea*, *vomiting*, and *uræmic manifestations.* The marked anæmia and puffy eyes are characteristic. The pulse is accelerated and of high tension, and, owing to circulatory obstruction, the heart soon shows secondary hypertrophy. The urine is scanty and turbid. The sediment shows *epithelial casts*, *leucocytes*, and *red blood cells*, and *albumin* is abundant. The urea is reduced in quantity. Retinal changes occur and gastrointestinal symptoms are common.

Prognosis.—The prognosis is grave. Recovery is rare in cases which persist for a year and over. Death may come suddenly or in uræmic coma associated with general dropsy.

Treatment.—The medicinal and hydrotherapeutic management is practically the same as in acute nephritis. If the patient is waterlogged and the heart is embarrassed, venesection, scarification of the lower extremities, and the administration of digitalis and other diuretics are indicated, as discussed under Dropsy.

Diet.—As chronic nephritis is undoubtedly accompanied by a reduction in the output of urea and chlorides, a not too rigid *vegetable and saltfree diet* appears indicated.

In cases tending to chronicity, it is unnecessary to persist in a fluid diet. A plain miscellaneous diet is indicated, avoiding cheese, cabbage, pastry, beans, fried sea food, beer, spirits, coffee, and tea. The patient may take raw oysters, raw clams, fresh fish, beef and mutton in moderation, chicken, salads, game, good bread, hominy, wheaten grits, rice, toast, oatmeal, gruels, spinach, summer cabbage, turnip tops, water cresses, lettuce, mushrooms, celery, rice and milk puddings, fruits. He may drink water abundantly, hot water, milk, skimmed milk, buttermilk, and mint tea. If there is much digestive disturbance and if perfect mastication is not performed, the meats may be scraped or finely chopped, made into balls, and broiled. In some instances experience will indicate a radical change, and a milk or vegetable diet will best answer. When this management is of no avail, renal decapsulation, as practised by Edebohls, may be indicated.

Five drops of dilute hydrochloric acid in water should be given after each meal, to aid digestion. Mild general massage is also indicated.

For the management of Dropsy see Dropsy and Effusion.

Chronic Interstitial Nephritis; Cirrhosis of the Kidney; Contracted Kidney

In this form of nephritis the kidney, when seen *in vivo* or *post mortem*, is small, hard, contracted, and nodular, with an adherent thick capsule. Clinically, we notice that dropsy is not a marked feature and that cardiovascular changes are pronounced. A tendency to this form of kidney degeneration runs in some families. Syphilis, alcoholism, gout, arteriosclerosis, and high living are factors in its production, or are associated features. Hypertrophy of the heart is constant.

Symptoms.—Increased arterial tension is the most important early symptom. The patient complains of malaise, headache, heart palpitation, cough, dizziness, ringing in the ears, and loss of appetite, and the tongue is coated. In due time enlargement of the heart is evident, followed by retinal changes, uræmic amaurosis, sudden blindness, and cerebral apoplexy. The skin is dry and pale, the ankles may be puffy, and hæmorrhage and purpura may develop. Sudden œdema of the glottis may occur, also acute pulmonary œdema, and uræmic coma and convulsions often end the scene. The urine is abundant, of low specific gravity, and contains albumin and a few casts.

Prognosis.—Chronic Bright's disease may be called incurable, but the patient may live in a fairly comfortable condition for many years. Arteriosclerotic degeneration is a slow process and may not affect both kidneys alike. One kidney may be completely degenerated and the other one only partly so, in which event life may be sustained until both organs are insufficient in function.

Treatment.—Medication will not arrest kidney degeneration. If the patient has contracted syphilis in early life, it would be wise to administer mercurials and iodides with the hope of arresting the vascular changes which may affect any organ. In chronic malarial disease with nephritis a course of quinine is advisable. Beyond these two points medication is useless. A quiet life in an equable climate and a plain mixed diet should be recommended, avoiding meats and salt as much as possible. In the way of drinks, good water, tea, coffee, mint tea, and ginger ale may be allowed; two ounces of whiskey may be taken in water in twenty-four hours. The bowels should move once a day. Five drops of hydrochloric acid after meals will aid digestion. Mild general massage three times a week is helpful on account of its influence on the circulation. For high arterial tension, venesection followed by nitroglycerine is indicated.

Dyspnœa and insomnia are distressing symptoms in Bright's disease from which subcutaneous injections of morphine, gr. ¼ to ⅓, with or without atropine, will give relief. The management of dropsy will be found in the chapter on Dropsy and Effusion.

THE SURGICAL TREATMENT OF ACUTE AND CHRONIC NEPHRITIS

Acute renal infection is occasionally so intense as to lead to a rapid and fatal termination. When renal tension can be relieved in no other way, an incision through the capsule of an acutely inflamed kidney is indicated and may establish a cure. Reginald Harrison, of England, has reported since 1896 a number of such cases and cures.

The proposition to treat chronic nephritis surgically was first made by Dr. G. M. Edebohls, of New York, in April, 1899, after various observers, including himself, Rose, Ferguson, and Newmann, had noticed the disappearance of albumin and casts from the urine after operations upon the kidney.

Nephritis following acute infectious diseases in children has a tendency to complete recovery. Children who survive the acute stage, but continue to show albumin and casts for several months, also make a complete recovery in the majority of cases. In a small percentage of cases recovery does not take place.

Patients who are affected with nephritis following diphtheria, scarlatina, measles, or malarial disease in early life may not entirely recover. Kidney insufficiency with uræmic symptoms and convulsions may develop at any age and is frequently manifested at the time of the first confinement.

In view of the uselessness of medication in chronic nephritis, the physician is justified in advising inspection of the kidney through a lumbar incision in cases in which an acute nephritis, not secondary to heart lesions, does not clear up in from six months to a year, and in suggesting decapsulation of one or both kidneys if they appear swollen and enlarged. For detailed information on this subject the reader is referred to Dr. Edebohls's monograph, *The Surgical Treatment of Bright's Disease*, 1904.

Uræmia in Nephritis

The symptom complex known under this name is probably due to retention within the circulation of poisonous materials which should be eliminated in the urine. The exact nature of these poisons is not definitely known. It has been suggested that so called uræmic coma and convulsions are due to œdema of the brain. Two urinary findings are practically constant in uræmia, viz.: a reduction of the amount of urea and the presence of tube casts.

Uræmia in the course of nephritis is a grave condition.

Symptoms.—The symptoms are headache, sleeplessness, coma, convulsions, paralysis, amaurosis, nausea, vomiting, delirium, dyspnœa, and increased arterial tension. The temperature may be normal, subnormal, or elevated.

In uræmic coma the history of Bright's disease may often be elicited; the onset is usually sudden with delirium and convulsions. The face is waxy pale, the body œdematous, the breathing stertorous, the pulse full and strong, usually slow, and the urine scanty and showing albumin and casts. Toward the end the Cheyne-Stokes type of breathing may occur. This condition may be more or less acute and rapidly fatal or persist for a long time.

Prognosis.—The prognosis is grave, but in the mild form recovery is possible. For *differential points between the various forms of coma*, see Coma.

Treatment.—Treatment of an acute uræmic attack: Venesection and enteroclysis are rational and safe procedures in uræmic coma or convulsions. Chloral hydrate, gr. x to xxx, per rectum, or morphine subcutaneously, gr. $\frac{1}{4}$, should be employed with great caution, as they are apt to overpower the heart. Chloroform inhalations sometimes give relief. Pilocarpine, in $\frac{1}{12}$ to $\frac{1}{8}$ grain doses, may be given with the hope of promoting diaphoresis. In desperate cases renal decapsulation may be employed.

PYELITIS AND PYELONEPHRITIS; PYONEPHROSIS; SURGICAL KIDNEY

The pelvis of the kidney may be the seat of inflammation which may have traveled upward from the bladder or may be primary in the kidney with a tendency to travel downward. The causative factors are calculi, tuberculosis, gonorrhœa, and all acute infectious diseases, such as typhoid fever, etc.

Symptoms.—The mild cases of pyelitis often pass unnoticed and recovery is complete in a few weeks. When suppuration has set in, there is a rise of temperature with chills and sweating, and the urine, though it usually remains acid, becomes turbid and shows blood and pus. The patient has a dull pain in the lumbar region of the affected side. In the chronic cases there is a persistence of all the symptoms in a mild way, with an evening rise of temperature. The general health fails, as in all wasting diseases, but the patient may live for years in comparative comfort. The writer is familiar with a case of suppurative pyelitis of twenty-two years' standing. The patient, a man fifty years of age and of good physique, is able to manage a large business and declines operative interference because he has neither pain nor urgent symptoms. In another class of cases the kidney is honeycombed with pus (surgical kidney) and shows tenderness on palpation. The septic symptoms are more severe in this class of cases, and unless they are relieved the patient succumbs.

The **diagnosis** rests upon the septic symptoms and the presence of pyuria.

The question of which side is affected can be answered by the local tenderness on palpation and by separately collecting the urine by means of the Harris segregator or ureteral catheterism. Kidney stones may be detected by means of an x ray examination, and tuberculosis of the kidney can be diagnosticated if on repeated examinations of the urine the tubercle bacilli are found.

Differential Points.—In suppurative cystitis the urine is alkaline, and tenesmus and pain are localized in or about the bladder; lumbar pain is more suggestive of pyelitis. In perinephritic abscess the pus does not escape through the urine; the lumbar region is tender on palpation, appears swollen, and may be œdematous.

Treatment.—In mild cases the kidney should be flushed by drinking liberally of water, mineral water, and mint tea. Disinfection of the urinary passages may be attempted by administering *urotropin* in 10 grain doses three times a day or methylene blue in 2 grain doses three times a day, to be given in capsule. Warm tub baths and sponge baths and a light nutritious diet are indicated. If a slow and steady improvement is manifest, operative interference may be deferred. Calculi, when diagnosticated and located, may be cut out. The diagnosis of tuberculosis of the urinary tract should not be accepted from any but an experienced microscopist, on account of the similarity of the harmless smegna bacillus to the tubercle bacillus. Mistakes of this nature have been made and kidneys have been unnecessarily sacrificed. Before a kidney is extirpated we must be sure that the other kidney is performing its function.

In the severe forms of pyelitis we have at our command the following plans of treatment:

Expectant treatment, with rest, the use of diluents and drugs, such as urotropin and salol.

The local treatment of a cystitis, especially those forms adjacent to a ureteral orifice.

Incision or dilatation of a stricture of a ureteral orifice.

Catheterization of the ureter and renal pelvis.

Irrigation of the ureter and renal pelvis.

Distention of the renal pelvis.

Instillations into the renal pelvis.

Permanent catheterization of the renal pelvis for some hours or days.

Nephrotomy (nephrolithotomy).

Nephrostomy for more or less permanent drainage through the side.

Nephrectomy in the advanced cases of pyelonephritis or pyelonephrosis.

PERINEPHRITIC ABSCESS

This ailment is occasionally overlooked. It may occur primarily from injury with infection, or secondarily by the extension of a neighboring inflammation.

Symptoms.—Localized pain and swelling, with fever, chills, and sweating, are noticeable in pronounced cases. The pain is deep seated in the lumbar region and may radiate into the thigh and genitals. The swelling may show fluctuation and present an œdematous appearance. There is percussion dulness in the flank, and bimanual palpation reveals a swelling or indurated mass. The urine is clear unless pyelitis is also present. In doubtful cases the use of the aspirating needle may be necessary for the diagnosis, and when pus is found the tumefaction must be incised and treated like any other abscess. A perinephritic abscess may be mistaken for appendicitis, empyema of the gall bladder, psoas abscess, or lumbago. When free drainage can be established the prognosis is good.

MOVABLE KIDNEY; FLOATING KIDNEY (NEPHROPTOSIS)

We recognize various degrees of abnormal kidney mobility. We speak of palpable kidney, movable kidney, floating kidney, and fixation of the kidney in an abnormal position. Floating kidney is rather common in women and is generally acquired, owing to the wasting of fat around the kidney or the relaxation of abdominal walls in consequence of repeated pregnancies and as an element of that general relaxed condition known as enteroptosis. The condition is recognized by means of bimanual palpation in the lying or standing posture. The patient aids in the examination by taking a deep inspiration, and when a kidney is quite out of place we notice a distinct flattening of the lumbar region on the side on which the kidney is loose or mobile. The recognition of a movable kidney in moderately nourished women, when a part or the whole organ can be palpated, does not present a difficult problem; but when the abdominal wall is thick, when the symptoms point to gallstones, impacted in the cystic or common ducts, or to a false or dislocated lobe of the liver, if the spleen or pancreas has become loosened, if the kidney is but slightly movable, if a third kidney is present, or if a congenital kidney presents, whether freely movable or attached to the false or true pelvis, when associated with gastroptosis, enteroptosis, uterine displacements, or other pelvic disorders, the diagnosis demands careful study. The displaced kidney can usually be felt as a tumor which can be replaced. The diagnosis of floating kidney should be made by palpation and never by the symptoms. The hepatic flexure of the colon has been mistaken for movable kidney.

Symptoms.—Dyspepsia, with motor, sensory, and secretory neuroses of the various abdominal viscera, is noticed in cases of floating kidney, but it is also a common complaint of hysterical and neurotic individuals. *Painful crises, mucous colitis, hydronephrosis,* and *intermittent albuminuria* have disappeared after fastening a movable kidney. The relation of movable kidney to Bright's disease and to appendicitis is of interest. According to the experience of Edebohls chronic appendicitis is the chief symptom and most important complication of movable right kidney. A dragging sensation and a feeling of weakness are the general symptoms in movable kidney.

Treatment.—When kidneys have become displaced from loss of fat in general emaciation, the patient may with benefit adopt the rest cure. Ordinary degrees of mobility can be benefited by wearing a plain *abdominal supporter*, or belt, which encircles and sustains the lower two thirds of the abdomen. All forms of apparatus with special kidney pads are useless or injurious. In lieu of a bandage a *straight front corset* which comes low down and properly supports the lax abdomen can be worn to advantage. Such a corset is best applied when the woman lies on her back. A floating kidney may be anchored in its proper place by operative means (*nephropexy*), and torsion symptoms are the principal indications for operation.

SUMMARY OF DIAGNOSTIC POINTS IN KIDNEY LESIONS

Tumors.—Tumor, pain, hæmaturia, cachexia, sarcoma in early life, carcinoma in later life.

Cysts.—Tumor, pain, discomfort, cloudy urine, cyst fluid on aspiration. Cysts are congenital or acquired.

Hydronephrosis.—History of torsion or blocking of ureter; painless, fluctuating unilateral tumor may be bilateral.

Floating Kidney.—Pain, neurasthenia, recognition of displacement by examination.

Pyelonephritis (*Surgical Kidney*).—Irregular low fever, occasionally chills and high temperature, pyuria, cystitis, sometimes enlargement and tenderness to touch. History of obstruction, stricture, large prostate, calculi plus infection (gonorrhœa or pus infection), or infection following pregnancy, abortion, and pelvic infection in women.

Tuberculous Pyelonephritis.—Constant irregular fever, chronic course, frequency of urination, hæmaturia, pyuria, tuberculous history, marked secondary anæmia.

Chronic Nephritis.—Constant albuminuria, casts, decrease in urea elimination, secondary enlargement of the heart, renal and cardiac dyspnœa, general or local dropsy, retinitis albuminurica.

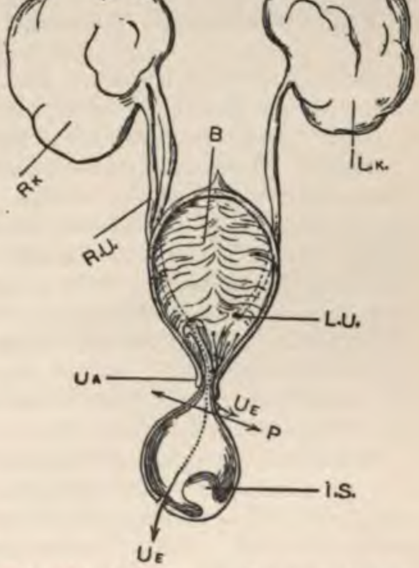

FIG. 154.—SACCULATED PROLAPSE OF THE RIGHT URETER.

THE URETERS

The ureters are liable to become obstructed by calculi or constricting bands or by the pressure of tumors. They may participate in the ulcerative tuberculous processes of the genitourinary tract. Torsion and kinking of the ureters sometimes take place in floating kidneys and give rise to *painful crises*, known as *Dietl's crises*. In such cases one sided pain or colic is usually present. By means of the Harris segregator or catheterism of the ureters we may definitely ascertain which side of the urinary tract is involved. Injury to the ureters is possible in major pelvic and abdominal operations. Prolapse of the inverted lower portion of the right ureter into the bladder and through the urethra, in a child two weeks old, was reported by the writer in the *American Journal of the Medical Sciences* for May, 1888.

Total extirpation of the ureter has been done in connection with extirpation of the kidney for malignant growths or calculous and tuberculous diseases (see case of Dr. Willy Meyer in the Jacobi *Festschrift*, 1900).

AILMENTS OF THE URINARY BLADDER

General Remarks.—The empty bladder lies behind the symphysis pubis. When the bladder is extremely full and distended, its percussion dulness may reach to and above the umbilicus. The neck of the bladder is surrounded by the prostate, and both are immovable. Suprapubic and rectovesical and vaginovesical palpation are readily performed. The introduction of the sound will determine the condition of the vesical walls or the absence or presence of calculi and foreign bodies.

Visual inspection is possible by means of the *cystoscope*. Digital exploration is possible through a suprapubic or perineal incision and in the female through the dilated urethra. Direct visual inspection of the bladder in women is best accomplished by Kelly's method with the patient in the knee-chest position.

Patent urachus, the remains of a fœtal structure (see section on Pædiatrics).

Exstrophy of the bladder is an absence of its anterior wall with deficiency in the corresponding abdominal wall. This condition can be remedied by a plastic operation described in special surgical works.

Vesical diverticula are sometimes met with. Various *injuries*, such as *contusions* and *perforating wounds*, resulting in rupture of the bladder, are met with and are of a serious nature when extravasation of urine results. When rupture is suspected, a soft catheter should be introduced into the bladder. If the urine comes away bloody, a measured quantity of boric acid solution should be injected into the bladder. In case of rupture, the full quantity of liquid cannot be regained by catheterism, and immediate surgical treatment may become necessary. *Inversion of the bladder* through the female urethra has been observed. In such cases the viscus presents in the form of a bluish pink sac.

Vesical hypertrophy is seen in cases in which an obstruction to the flow of urine has developed gradually. When a *fistulous opening* between the bowel and bladder exists, foul gas and fæcal matter will be expelled with the urine. *Vesicovaginal fistula* may occur from childbirth and from injury.

Vesical neuroses and irritability of the bladder are usually of a reflex nature, depending upon disease of neighboring organs. A marked irritability of the bladder is occasionally observed in cases of appendicitis. Neurotic individuals, adults as well as children, urinate frequently. On the other hand, neurotic retention of urine is not uncommon. Retention is often observed after childbirth or following operations on the rectum and penis. The inhibitory effort is due to the dread of exciting pain. In such cases the application of a hot water bag is often efficacious. *Noc-*

turnal incontinence in children is discussed in the section on Pædiatrics. In some neurotic individuals there may be a local irritation due to the deposit of crystals in the urine. When a cystoscopic examination is made in a case of irritable bladder, a localized hyperæmia of the trigonum is often found. In protracted cases of this nature a few applications of a 5 per cent solution of nitrate of silver directly to the red patches will have a curative effect.

Paralysis and atony of the bladder, with retention or incontinence, are met with in serious lesions of the central nervous system, as in locomotor ataxia and spinal sclerosis. The treatment for such conditions must be directed to the underlying cause, and when syphilis of the nervous centres is suspected, energetic antisyphilitic treatment is indicated. In cases of incurable incontinence a rubber urinal may be worn by the sufferer.

ACUTE CHRONIC AND ULCERATIVE CYSTITIS AND PERICYSTITIS

Causes.—Cystitis is due to chemical or mechanical irritation combined with infection. Calculi, foreign bodies, unclean catheters, foul urine, tumors, and syphilitic and tuberculous ulcers are causative factors. Cystitis may be due to the extension of a neighboring inflammation, as in gonorrhœal urethritis. Cystitis is occasionally a complication in the course of infectious fevers. In some instances an examination of the bladder shows nothing more than redness at the trigonum. In other cases the cystoscope will reveal ulceration or a bullous œdema of the mucous lining of the bladder. In chronic cystitis the vesical walls are usually very much thickened.

Ulceration in the bladder may be due to traumatism, thrombosis of veins, pus infection, syphilis, tuberculosis, or carcinosis. *Hæmaturia* is generally observed in such cases.

Symptoms.—The symptoms of cystitis are characteristic; *dysuria, pain on pressure over the pubic region, and cloudy urine loaded with bladder epithelia and pus cells or blood.* The urine soon acquires an *ammoniacal odor* and may become putrid. *Fever* is usually present, and in a severe form the patient has *chills.* A vesical neurosis is often taken to be cystitis; in the former the urine is free of pus.

Differential Diagnosis of Cystitis and Pyelitis.—The reaction of the urine in pyelitis not associated with cystitis is *acid.* The white blood corpuscles in cystitis have a rounded contour, those from the kidney pelvis have distorted forms. In cystitis with marked pyuria the albumin rarely exceeds from 0.1 to 0.15 per cent. In pyelitis with little pyuria the albumin ranges from 0.15 to 0.3 per cent.

Treatment.—The treatment is *radical* or *palliative.* In catarrhal cystitis with superficial simple ulceration, in which palliative treatment is of no avail, local cauterization may be indicated. Tuberculous ulceration may require direct local treatment in cases in which bladder irrigation with boric acid solution or with iodoform emulsion fails to give relief.

The radical treatment is directed to the *primary cause.* The palliative treatment consists of rest in bed, opium and belladonna suppositories, subcutaneous injections of morphine, and the free administration of warm drinks (flaxseed tea or peppermint tea). If the symptoms are urgent, it may be well to irrigate the bladder by means of a fountain syringe and a soft rubber tube once or twice a day with some mild antiseptic solution, such as boric acid solution (2 per cent) or formalin solution (5 to 10 minims to a pint). In *chronic cystitis* vesical drainage and direct local treatment in conjunction with hygienic measures may be called for. Drainage may be effected through a perineal incision a suprapubic incision, or, in the female, through the vaginal fornix.

STONE IN THE GENITOURINARY TRACT

Concretions, or stones, are found in both sexes and at all ages in the kidneys, ureters, bladder, urethra, and occasionally the prostate gland and the seminal vesicles. The general symptoms of stone in the urinary tract are *pain, local tenderness, colic, hæmaturia, pyuria*, and a *paroxysmal fever* which is often mistaken for atypical malarial fever. The passage of calculi makes the diagnosis positive. In making a diagnosis we require time, a good history, a physical and urinary examination, and possibly cystoscopy, radiography, ureteral catheterism, and exploratory incision.

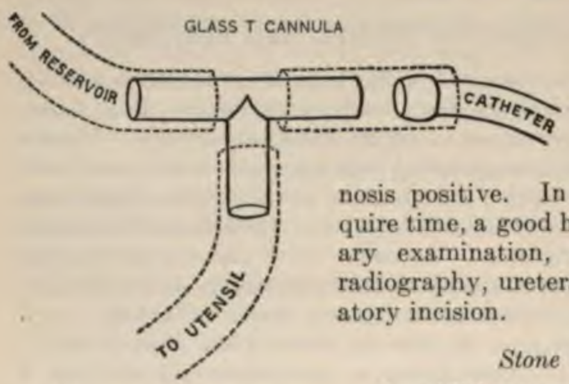

Fig. 155.—For Bladder Irrigation.

Stone in the Kidney

In addition to the general symptoms just mentioned, the urine shows albumin and casts, the pain is often paroxysmal and intense, accompanied by nausea and fainting, and radiates downward into the thigh and the pubic region. Frequent micturition is generally present. A positive diagnosis is often impossible, unless the patient has been under observation for some time. Therefore surgical interference should not be hastily carried out except in cases of urgency and complete obstruction. Fine gravel may be passed for years without giving rise to marked symptoms, and gravel is occasionally found in the diapers of infants. An attack of renal colic is usually followed by a feeling of general prostration, and an aching pain is complained of in the region of the affected kidney.

Differential Points.—In biliary colic the pain is localized more toward the middle line and is apt to radiate into the back, and frequently there is jaundice. A floating kidney is made out by a physical examination. In some instances appendicular colic or intestinal colic may be confounded with renal colic, particularly in fat individuals. In such cases the correct diagnosis is made after a small stone is found to have passed with the urine. A stone in the ureter can occasionally be felt through a lax abdomen, particularly when the patient is examined under ether. *Calculi in the ureter* give the usual colicky and retention symptoms on one or on both sides. Impacted stones may cause ulceration and perforate through the ureters.

Stone in the Bladder

Stone in the bladder gives rise to frequent micturition and tenesmus and causes ammoniacal or cloudy urine. Prolapse of the rectum is occasionally present in connection with stone in the bladder. The stone may be detected by sounding the bladder or by digital examination by the rectum or vagina. Stone in the *urethra* produces strangury, hæmaturia, and retention of urine. Stone in the *prostate* and in the *seminal vesicles* may be suspected in all inflammatory conditions in these organs. In obscure cases, in which stone is suspected somewhere in the genitourinary tract, an examination with x rays is of importance, or an exploratory nephrotomy should be done. In attempting to examine a patient with the x ray, the bowels and bladder should be empty and the patient should be placed upon his belly on a large sensitive plate. The tube is fixed so as to be over the umbilicus, about eighteen inches from the plate. Calculi of oxalates or phosphates give the best shadows. The fluoroscope is not suitable for this kind of work.

Prognosis.—Renal calculi may pass for years without giving alarming symptoms. Frequent attacks of colic and the evidence of an inflammatory condition of the genitourinary tract, as shown in the urine, call for radical treatment.

Differential Points.—In tuberculosis of the genitourinary tract there is marked cachexia, tubercle bacilli are sometimes found in the urine, and there may be a family history of tuberculosis. In malignant tumor there are marked cachexia, loss of weight, and a palpable tumor. In movable kidney there is an absence of hæmaturia and pyuria. The kidney is palpable and can be replaced. In vesical inflammation from stone or tuberculosis in the bladder, the epithelia in the urine will be vesical. A rectal and cystoscopic examination will give additional proof of the bladder trouble. Ulcer of the stomach and aneurysm of the aorta may give rise to symptoms somewhat akin to those of renal colic. A careful examination will reveal the origin of the pain. Careful palpation will make out a large kidney; a stone in the kidney can never be felt. Before operating upon one kidney, the condition of the kidney on the other side should be carefully looked into, as explained elsewhere.

Treatment.—An attack of stone colic is best managed by administering morphine hypodermically in ¼ to ½ grain doses. Rest in bed and a fluid or semisolid diet should be insisted upon. A hot water bag should be placed over the seat of the pain. The urine which passes must be carefully examined for bile, blood, blood pigments, and concretions.

Should palliative treatment fail to relieve the patient, or should frequent attacks foreshadow a severe inflammatory condition of the genitourinary tract, radical surgical treatment is indicated and often gives satisfactory results. If nephrolithotomy can be performed before the kidney is extensively destroyed, the fatality attending such an operation is not above 10 per cent. With extensive destruction of the kidney the mortality reaches 50 per cent. After the passage or the operative removal of stones, the after-treatment will consist in the administration of large quantities of pure water or aromatic tea, such as peppermint tea, with a view of overcoming the tendency to stone formation. *Urotropin*, in 10 grain doses three times a day, may be given for some weeks or until the urine appears to be clear. After the removal of the stone from the bladder by a crushing or cutting operation, another stone may make its appearance after a time. This may be due to an erosion of the bladder mucosa which favors the deposit of urinary salts, or a second stone may have come down from the kidney or have been overlooked before. In one instance the author observed in a young woman the *passage of small stones with short and long hairs attached.* These stones came down from a dermoid broad ligament cyst which had ruptured into the bladder.

The causes which lead to stone formation are not well understood. Generally speaking, all pathological changes in the urinary tract favor the precipitation of urinary salts. On the other hand, there are cases in which stone formation appears to be the primary lesion.

SYPHILIS OF THE GENITOURINARY TRACT

Syphilitic disease of the genitourinary tract cannot positively be distinguished from other inflammatory and degenerative processes, except by the therapeutic test (the administration of mercury and potassium iodide) and by taking into consideration the clear cut history of syphilitic infection. In doubtful cases the patient should always have the benefit of the doubt and receive the antisyphilitic management, which is fully described in the chapter on Syphilis. Renal syphilis is supposed to assume the form of amyloid degeneration. The body of the testicle may show syphilitic tumefaction, and the bladder may suffer by reason of syphilitic ulceration.

TUBERCULOSIS OF THE GENITOURINARY TRACT

The genitourinary organs may participate in a general miliary tuberculosis. The insidious and chronic tuberculosis in this region may start in the kidney and travel to the bladder, or vice versa. Infection certainly takes place through direct contact, as shown by the infection of the husband by the wife or the wife by the husband. In some instances renal and vesical tuberculosis is observed in individuals in whom there is absolutely no evidence of tuberculosis anywhere else. This may be explained by assuming that the infecting tubercle bacilli have actually entered the circulation and have subsequently lodged in the kidney instead of elsewhere. Primary tuberculosis of the prostate and epididymis is not infrequently the starting point of the general infection of the genitourinary tract, but we find it more frequently secondary to pulmonary or intestinal tuberculosis.

Diagnosis.—A turbid urine mixed with blood is the first characteristic symptom of the disease. Tuberculous pyelonephritis presents the following clinical picture: There is polyuria with lowered specific gravity and acid reaction, the urine is pale in color, its odor is not offensive, and it contains *albumin, pus, blood, a profuse sediment,* a few *casts* and *renal epithelia,* some *bladder epithelia,* and *tubercle bacilli.* A definite conclusion as regards the involvement of one or both kidneys must be arrived at by a cystoscopic examination and an examination of separately collected urine. One of the most valuable signs of tuberculosis of the kidney is the marked change at the orifice of the corresponding ureter. In obscure cases the tuberculin test may be of value. The positive diagnosis is made with the microscope. *As the smegma bacillus shows great similarity to the tubercle bacillus, special methods of staining should be practised, and cultures and animal inoculations may be necessary to avoid error* (see Laboratory Aids to Clinical Diagnosis).

TUBERCULOSIS OF THE BLADDER

Primary vesical tuberculosis is very rare. We find the disease more frequently associated with tuberculosis of the prostate and seminal vesicles. It gives the symptoms of a chronic cystitis. Frequency of micturition becomes marked, the pain is severe, and hæmorrhage is not unusual. The general health becomes greatly impaired. An examination with instruments is painful and usually accompanied with hæmorrhage owing to the ulcerated condition of the bladder in such cases.

Diagnosis.—The diagnosis of primary cases is often so difficult that a suprapubic cystotomy may be indicated for diagnostic purposes and for the purpose of draining the bladder with the hope of giving relief and effecting a cure by keeping the bladder at rest.

Treatment.—A strictly localized tuberculosis of one kidney or of the prostate gland or the testicle may be cured by the prompt extirpation of the infected part. When such a course is not feasible or indicated, the general hygienic management for tuberculosis should be carried out, and palliative treatment, as described under Chronic Cystitis, should be adopted.

BENIGN AND MALIGNANT NEW GROWTHS

Benign tumors and *cysts of the kidney* do not always give rise to renal symptoms; occasionally a kidney is found to be entirely transformed into a multilocular, simple, or hydatid cyst. The diagnosis is made by means of bimanual palpation, by exploratory puncture, or by exploratory incision. The treatment is surgical. Malignant renal growths are not rare; they are found at all ages, even in children. Hæmaturia is present in about 50 per cent of such cases. A visible tumefaction is noticeable and a tumor is made out by palpation. *Paranephritic cysts* may be of traumatic origin. They present a fluctuating tumor holding a chocolate colored fluid.

Differential Points.—Neoplasms of the retroperitoneal glands are more centrally located and usually immovable. Tumors of the left kidney are frequently mistaken for splenic tumors. In cases of enlarged spleen the percussion dulness is absolute over the tumor, whereas in renal tumors the inflated colon usually crosses the renal tumefaction and gives a tympanitic percussion sound. The spleen has a characteristic outline and moves with respiration.

Prognosis and Treatment.—Benign neoplasms give but little trouble. *Malignant tumors* involve an unfavorable prognosis; when their radical removal is possible it should be done. *Sarcoma of the kidney* has been radically and successfully removed in children of a tender age. When operative interference is out of the question, every effort should be made to make the patient comfortable, and no restrictions as regards food, alcohol, or tobacco should be suggested or enforced.

Hydronephrosis is discussed in the chapter on Dropsy.

Benign and Malignant Tumors of the Bladder.—*Polyps, cysts,* and *malignant* and *benign solid* tumors give symptoms of chronic cystitis and usually demand surgical treatment. Pericystic inflammation may be subdued by applying hot water bags. Should pus form, a free incision is indicated.

Congenital malformations and defects of the kidney are occasionally met with. Some persons have but one kidney, others have supernumerary kidneys, some kidneys have a horseshoe shape, etc.

Injuries to the kidneys are recognized by the accompanying hæmaturia in connection with the history of traumatism. According to the extent and nature of the injury, palliative treatment, rest with opiates, or surgical interference is called for.

PARASITES OF THE GENITOURINARY TRACT

Strongulus gigans (palisade worm), distoma hæmatobium, and filaria sanguinis are parasites which may be taken into the system with the drinking water, and are found in the urine of persons who live in a tropical climate. They give rise to lymphatic obstruction and to symptoms of pyelitis. The urine in such cases is milky. This condition is known as *chyluria.*

Filaria is a worm several inches long, which may live for years in the lymphatics. Thymol, 1 to 10 grains, several times a day, and methylene blue, 2 grains every four hours, have been given internally to destroy the parasite. The clinical symptoms of *Bilharzia hæmatobia* arise from the burrowing of the eggs in connection with their hatching. The symptoms are *hæmaturia, pain,* and *tenesmus; granulation tumors* have been known to form in the mucous membrane of the bladder; and eventually renal obstruction and suppuration may supervene. A positive diagnosis is made by finding the ova or embryos in the urine. The treatment by the administration of male fern has not given satisfactory results. Surgical means have been employed in suppurative cases.

Echinococcus.—The cyst of echinococcus may involve the kidneys and the bladder, giving rise to symptoms of pyelitis or cystitis. The hooklets of the parasite may be found in the urine. The *treatment is surgical,* particularly where there is tumor formation.

Pediculi pubis are animal parasites having their habitat in the hairy part of the pubic region, as described in the dermatological memoranda.

LOCALIZED AND MINOR AILMENTS OF THE MALE GENITAL ORGANS

Penis

Epispadias, or congenital opening of the urethra on the upper part of the penis, is sometimes associated with ectopia vesicæ. In severe cases an attempt should be made to remedy this congenital defect by a plastic operation.

Hypospadias is of more frequent occurrence than the former defect. The orifice is usually situated at the base of the glans, and in severe cases is joined by a deep fissure which divides the scrotum in the middle line, forming labia, as in the female. In this event it is likely to be mistaken for *hermaphroditism*, a maldevelopment characterized by the coexistence of fully developed ovaries and testicles in one individual. A plastic operation has been devised for hypospadias.

Balanitis.—Inflammation of the glans penis may be caused by lack of cleanliness, purulent discharges from the urethral canal, specific ulcers, and the like. By attention to the cause, cleanliness, and the use of antiseptic dusting powders the inflammation may generally be made to subside within a short time.

Paraphimosis, or constriction of the prepuce behind the glans, gives rise to œdema and cyanosis, and if not soon relieved, to gangrene. In early cases reduction may be effected by drawing the foreskin forward while pressure is exerted simultaneously upon the glans. In cases of long standing reduction should be preceded by division of the constricting band.

Phimosis.—Stenosis of the preputial orifice, if left untreated, is very likely to give rise to balanitis, paraphimosis, and a number of reflex nervous irritations, such as enuresis, etc. Hence the advisability of early treatment. In quite a number of cases this condition may be successfully remedied by dividing the stenosed border by a few small longitudinal incisions and by retraction of the prepuce. In severe cases, however, circumcision must be resorted to (see Pædiatrics).

Herpes præputialis is a vesicular eruption of the penis which may terminate as a simple ulcer, and which is apt to be mistaken for the initial lesion of syphilis. It generally disappears rapidly under treatment with sedative lotions or dusting powders as does *eczema of the prepuce.*

Benign tumors, such as cysts, fibromas, etc., are sometimes observed on the glans and prepuce. The treatment is the same as for tumors affecting other portions of the body.

Priapism is a term used when the penis is in a chronic state of erection from central nervous disease.

Chordee is a painful erection with curvature from various transitory causes.

Urethra

Diverticula of the male urethra are rare.

Stenosis of the urethral orifice is readily enlarged by cutting under cocaine.

Stricture, or narrowing, of the urethral canal is of quite frequent occurrence and the cause of numerous ailments of the genitourinary tract. In the great majority of instances stricture is the result of specific urethritis, although traumatism and an unhealthy condition of the urine are occasionally the causes of the development of stricture. The most frequent situation of the stricture is in the neighborhood of the triangular ligament.

SYMPTOMS OF STRICTURE.—Increased frequency of urination, gradual reduction in the size of the stream, dribbling from the urethra, and "incontinence from retention." In cases of long standing there are symptoms of cystitis and later involvement of the ureters and kidneys.

TREATMENT.—Slight strictures of recent development frequently yield to the treatment with astringent injections, warm baths, ichthyol crayons, alkaline diuretics with belladonna or hyoscyamus, etc. These remedies should always be employed in cases of "*spasmodic*" stricture, a reflex contraction of the muscular fibres of the urethra, which is apt to be mistaken for organic stricture. Cases of long standing which fail to improve under the simple measures just outlined require operative interference. The mechanical means to be resorted to are gradual dilatation, continuous dilatation, dilatation by means of expanding instruments, internal incision, and division from the perinæum.

Urethral caruncles at the orifice sometimes give rise to reflex symptoms which disappear when the excrescences are cauterized or cut away.

Papillomata and polyps of the urethra give rise to reflex symptoms and discharges. They may be located by means of Klotz's urethroscope and cauterized or removed by the snare or knife.

Urethral Calculus.—A small stone may become impacted in any part of the urethra and give rise to pain or also to retention of urine when the stone is large enough to obstruct the urinary canal.

TREATMENT.—If far forward, the stone may often be removed by gentle manipulation or the urethral forceps; otherwise operative interference must be resorted to in cases in which the obstruction is very pronounced.

Periurethral abscesses are occasionally met with. They give rise to local disturbance and the so called urethral chill, and require the knife.

Simple non-venereal urethritis from local irritation or irritating food and drink or from gouty diathesis yields to cleanliness and general hygienic management.

Prostate

Prostatism without enlargement of the prostate is due to a contracture at the neck of the bladder of fibrous and inflammatory origin, probably gonorrhœal, owing to which an obstruction to the outflow of urine is offered.

TREATMENT.—Galvano-caustic incision of the indurated neck of the bladder offers the best chances of cure in severe cases.

Enlargement of the Prostate.—Men advanced in years usually suffer from more or less disturbance of the prostate. Gradual *hypertrophy* is the most frequent affection. One or more lobes may become enlarged, and the symptoms vary according to the extent of the enlargement. The chief characteristic of this disease is impediment to emptying the bladder, residual urine, marked strangury, and not infrequently severe pain; soon symptoms of cystitis supervene and the urine shows the presence of pus and blood.

The **diagnosis** is made positive by rectal digital examination.

As the causation of this affection is not thoroughly understood, the **treatment** must necessarily be symptomatic. An endeavor should be made to relieve the symptoms by hot sitz baths, hot water injections, irrigation of the bladder, alkaline diuretics and hyoscyamus internally, and morphine, belladonna, and ichthyol in the form of suppositories. Operative interference is the last resort and gives very good results in many cases.

Acute Prostatitis.—Inflammation of the prostate may be either acute or chronic.

The CAUSES of acute prostatitis are chiefly specific urethritis, traumatism, and occasionally infectious diseases. The onset is usually sudden, with increased frequency of micturition, a sensation of heat and weight in the perineal region, often pain during micturition and defæcation, and, if long continued, also more or less constitutional symptoms. The latter is particularly the case if the inflammation is very pronounced and an *abscess* forms.

TREATMENT.—Rest in bed with the hips elevated, leeches to the perinæum, ichthyol and opium suppositories, and catheterism if the patient is unable to pass his urine naturally. Should pus form, the abscess should be incised and drained.

Chronic prostatitis may arise as a result either of the acute variety or of excessive sexual excitement, urethral stricture, hæmorrhoids, and vesical calculus. The symptoms generally set in slowly. There are dull pains, increased frequency of urination, partial impotence, and a periodic discharge of a mucoid or mucopurulent fluid from the urethra. The treatment of this condition is practically the same as that of the acute variety, plus removal of the cause. Massage of the prostate is alleged to be a very efficient remedy in this condition, but local treatment must not be prolonged over an undue period.

The **seminal vesicles** may be the seat of inflammation or stone. Stripping of the vesicles with the finger in the rectum is of value whenever active massage of the parts is indicated. Undue and prolonged or frequent stripping is harmful.

Testicles and Spermatic Cord

Anorchidism and polyorchidism are rare.

Cryptorchidism (**undescended testicle**), sometimes mistaken for hernia, is very frequently observed in infancy. The testicle remains in the abdominal cavity or may be found at any point in the inguinal canal. Descent usually takes place spontaneously, and the abnormity requires no interference unless the testicle has made for itself a false passage or gives rise to much pain and tenderness.

Orchitis and Epididymitis.—Inflammation of the testicle or epididymis may be due to gonorrhœa, traumatism, or impaction of a calculus. Orchitis is sometimes a complication of parotitis. There is pain in the testicle and along the spermatic cord. If the epididymis only is involved, the swelling is limited to the lower and posterior portion of the testicle; otherwise the entire testicle and scrotum are œdematous and very painful to the touch, with occasionally constitutional symptoms.

TREATMENT.—Rest in bed, hot fomentations, and anodynes for the relief of pain; later a suspensory bandage and the following local application:

℞ Ung. hydrarg.,	ʒij;
Lanolini,	ʒvj;
Ichthyol,	ʒj;
Ext. belladonnæ,	gr. x.

M. S.: Apply externally twice daily.

In the event of pus formation an incision is necessary.

Varicocele, or a dilated and varicose condition of the spermatic veins, is more common on the left side. The ætiology of this condition is not quite clear. It is generally observed in people whose occupation involves protracted standing. The diagnosis is readily made by inspection and palpation, the veins presenting a soft, irregular, opaque, knotted, pyriform mass. There may be a sensation of dragging or severe pain.

TREATMENT.—A suspensory bandage, general tonic treatment, and attention to the bowels. In severe and protracted cases, radical cure by means of subcutaneous ligature.

Hydrocele is an accumulation of serum in the tunica vaginalis testis. The fluid may be contained in the tunica vaginalis proper—*vaginal hydrocele*—and this is further spoken of as *congenital* when the tunica vaginalis preserves its communication with the general peritoneal cavity; again, the fluid may be contained in a cyst in connection with the spermatic cord, when it is spoken of as *encysted hydrocele of the spermatic cord*. The diagnostic signs are translucency, fluctuation, absence of impulse on coughing, and absence of pain.

TREATMENT.—Puncture of the swelling with a trocar and cannula, with or without the injection of a stimulating fluid (e. g., tincture of iodine or carbolic acid). A radical operation is often necessary for a cure. (See also Dropsy.)

Hæmatocele is an extravasation of blood in the tunica vaginalis. It is most frequently caused by injury to the scrotum. It resembles hydrocele in shape, but it differs from it by its sudden appearance, absence of translucency, and the presence of pain and ecchymosis.

TREATMENT.—An ice bag and cold lotions externally and rest in the recumbent posture; if an abscess forms, free incision and drainage.

Wounds and **gangrene** of the **testicle** necessitate prompt surgical treatment.

Neuroses and neuralgias of the male generative organs are very common in neurotic individuals. In the absence of some source of local irritation about the anus and genital region, a general tonic treatment is indicated, including outdoor exercise, regulation of the bowels, cold douching, iron, bromides, etc.

Skin manifestations of the male generative organs, such as lymphatic varix, intertrigo, eczema, pruritus, erysipelas, œdema, and gangrene, and the occurrence and treatment of inguinal lymphadenitis are discussed in other chapters.

Benign and malignant tumors, syphilis, tuberculosis, stone, and parasites of the male generative organs are discussed in a previous chapter.

CHAPTER XVIII

THE GENITOURINARY SYSTEM—*Continued*

VENEREAL DISEASE IN THE MALE AND FEMALE AND DERANGEMENTS OF THE SEXUAL FUNCTION IN THE MALE

SYNOPSIS: Syphilis, Chancroid, Gonorrhœa.—Prevention of Venereal Disease.—Derangements of the Sexual Function in the Male.—Priapism, Masturbation, Pollution, Impotence, Sterility of the Male or through the Male.

INTRODUCTORY REMARKS

THE sexual appetite is a natural instinct in all healthy individuals. Its gratification, especially by illicit sexual intercourse, is often followed by disastrous results to the individual in the shape of annoying and dangerous disease transmitted at the time of the sexual act. **Chancroid** infection remains local and runs the course of an acute ailment with no important sequelæ.

Gonorrhœa, which is looked upon as a trivial accident in sexual life by the laity, is in reality a severe infection, with far reaching sequelæ for the male and female, and particularly for the innocent married woman, whose pelvic organs so readily become infected from a latent gonorrhœa of the husband, this giving rise to untold suffering and often necessitating severe operative interference.

Syphilis, with its chronicity and sequelæ, is the cause of much of the misery which the physician encounters all the year round. Although venereal disease may be innocently acquired, such ailments are almost always spread through the agency of male profligates and female prostitutes. On ethical grounds, it may not be correct to license an evil like prostitution, but unless we take the ground that the dangers of extramarital sexual intercourse, like the dangers of alcoholic indulgence, are character builders, weeding out the unfit and timid who shirk the responsibilities of marriage, it will be well to protect the ignorant, the careless, and the innocent by restricting the spread of venereal disease, as we do in the case of other communicable diseases. To this end, the control of the social evil should be taken out of the hands of the police and placed in the keeping of a sanitary or hygienic board or body, whose duty it would be to formulate and carry out humane, practical restrictions in lieu of the brutal and cowardly methods now in vogue against the unfortunate fallen woman who is more the product of man's unjust social laws, than naturally depraved. Prostitutes must be segregated, frequently examined, and, if disease has developed, isolated and given medical care, as in other instances of communicable disease. It should be the duty of physicians to instruct young men of their clientèle and their parents as to the dangers of prostitution and as to the safety of marriage in this respect. This campaign of education should be extended to high schools and colleges for young men.

Men and women suffering from venereal disease and knowingly infecting others must be punished by law.

SYPHILIS IN ADULTS AND CHILDREN

Syphilis is an infectious disease, the microorganism of which is as yet unknown. It has a distinct period of incubation with a train of systemic disturbances, like all other eruptive fevers. It is in a measure self-limited and confers immunity. It is influenced by specific treatment. It may run a benign or semimalignant course.

As the ordinary mode of transmitting syphilis is by sexual intercourse, the usual portal of entrance is the genital apparatus; but as other modes of infection by accidental contact are not infrequent, the initial lesion is occasionally encountered elsewhere. Syphilis may be looked for under any circumstance of life; no one is absolutely secure against the possible acquisition of this disease. It is not infrequently contracted in surgical and midwifery practice. The initial lesion, or *syphilitic chancre,* cannot in its *first stages* be distinguished from herpes, simple or chancroidal excoriations, etc. The *mature indurated chancre* is sufficiently characteristic in appearance to make the diagnosis. It is a circumscribed hardness, of about the form of a split pea, not painful. It is stationary for a time and then disappears, but usually leaves an induration. Extragenital chancres and chancroids situated in the vagina or on the cervix uteri are readily overlooked.

After the chancre has been in existence for about six weeks or more, and a swelling of the neighboring lymph nodes has taken place, a skin eruption makes its appearance, which is macular, papular, or pustular in character. About this time a general feeling of malaise is experienced, together with an irregular fever temperature and throat symptoms (mucous patches). The eruption may vary in appearance from roseolar spots or measleslike spots to pustules similar to those of smallpox, but showing no typical umbilication. Occasionally a confluent pustular eruption presents itself in larger patches with deep ulceration and scab formation (*rupia syphilitica*).

Tertiary Manifestations.—Whereas the secondary manifestations are of an acute character and are more or less confined to the lymph nodes, skin, and throat, the tertiary phenomena, which come on after several years, show a marked chronicity or tendency to relapse, and may be present in any organ or tissue of the body in a multitude of shapes, such as granulation tumors, scaly skin eruptions, amyloid degeneration, etc. A syphilitic endarteritis may be manifest in the brain and spinal cord, in the viscera, including the eye, in bones and muscles, and result in the most formidable organic changes in the various organs and tissues.

Such is the typical course of syphilis; but there are many variations in the course of the disease in various individuals, depending upon the intensity of the infection and the natural resistance of the body as influenced by constitution, habits of life, and, above all, judicious treatment. Syphilis may imitate almost any other disease.

Syphilis of the mouth and throat, of the liver, of the gastroenteric tract, of the circulatory system, of the urinary tract, and of the brain and spinal cord is described under the various headings.

Prophylaxis.—Personal prophylaxis consists in continence, or personal purity, or the wearing of a condom. The proper attitude of the State toward venereal disease should be the same as toward any other communicable ailment. Marriage should not be contracted until two full years have elapsed after the date of infection, during which time prolonged and thorough treatment must be carried out.

Instructions to Those Suffering from Syphilis.—Syphilis is a constitutional disease. It is "in the blood." Local remedies and taking medicine for a *few months* will not cure you. *You must be treated for two to three years.* The effects of this disease are far reaching, and if treatment is neglected, much trouble and suffering may be caused, not only to yourself, but to others. The following rules must be observed during the first year: 1. Sexual intercourse should not be indulged in. 2. Sleep alone. 3. Under no circumstances should any one be allowed to use your toilet articles, such as towels, brushes, combs, razors, shaving brushes, etc. 4. No article that has been in your mouth should be used by others, such as tooth brushes, tooth picks, pencils, pipes, cigars, cigarettes, forks, spoons, drinking cups, etc. 5. You must not kiss any one. 6. Brush your teeth night and morning and keep your mouth clean. 7. If you have bad teeth, have them attended to by a dentist, and be sure to tell him that you have syphilis, so that he can take necessary precautions and avoid the possibility of infecting others (Dr. Cabot).

Treatment should be given as soon as a positive diagnosis has been made. In mercury and potassium iodide we have the specific medication for syphilis. *Inunction cure:* One drachm of mercurial ointment, containing some lanolin, is rubbed into the skin over various parts of the body once a day for six days. A warm bath is taken on the seventh day, and on the eighth day the mercurial inunctions are resumed. This is continued until thirty courses of inunctions have been given. Subsequently mercuric biniodide or protiodide, gr. 1/8, may be given three times a day for weeks or until salivation is produced. During the administration of mercury the mouth must be kept scrupulously clean and a mouth wash and gargle of potassium chlorate should be frequently used. Biniodide of mercury may be given combined with potassium iodide, and bichloride of mercury with sodium chloride.

Injections of gtt. xv of the following mixture, deep into the buttocks, under antiseptic precautions is another good form of treatment.

℞ Hydrarg. salicyl.,	gr. xxij;
Ol. olivæ,	ʒiijss.;
Lanolin.,	ʒss.

M. S.: Inject every five, six, or seven days.

℞ Hydrarg. chlor. cor.,	gr. xv to xxx;
Aquæ,	℥jv;
Sodii chlorid.,	ʒj to ʒjss.

M. S.: Inject 20 drops every other day into the gluteal region.

The use of mercury must be suspended if salivation appears. In addition to the specific treatment, the general condition should be kept at par or improved by means of warm baths, physical exercise, liberal diet, and avoidance of overfatigue and worry.

A sea voyage is beneficial or a sojourn in the mountains. After the lapse of six months the patient should present himself for a second course of treatment of a milder nature. A third course is advisable in the second year. The manifestations of syphilis on the skin and mucosa require but little local management when the *constitutional treatment is energetic.*

The tertiary manifestations of syphilis are amenable to treatment with potassium iodide and a tonic regimen.

In the present state of our knowledge the curability of syphilis cannot be denied, particularly when we observe reinfection after an alleged cure. On the other hand, it is a well known fact that syphilitic degeneration of vital organs may threaten and destroy life after years of apparent cure and freedom from symptoms. It is quite important to examine the blood of syphilitics and to stop the mercurial treatment and institute a tonic regimen when secondary anæmia is detected.

Hereditary Syphilis; Congenital Syphilis; Syphilis Hereditaria Tarda

Inherited syphilis may be due to maternal or paternal infection. A syphilitic father may beget a healthy child, and a mother who has borne a syphilitic child may be herself immune. The mother may be infected after conception and may bear a healthy or syphilitic child.

The **acquired form** is rare in infants. Infection may take place through kissing, from a wet nurse, and by other accidental contact, or may be conveyed in the rite of circumcision. The *symptoms* and *treatment* are the same as in adults; the dose of drugs to be employed is $\frac{1}{20}$ of that for adults.

The Congenital Form of Syphilis in Infants.—Many syphilitic children are still-born or die soon after birth. The more severe lesions are found in the bones, liver, spleen, and mucous membrane of the respiratory tract and the mouth. The changes in the liver are interstitial and gummatous, and due to endarteritis as in other organs and viscera. Syphilitic bronchostenosis is occasionally observed. The *skin lesions* in congenital syphilis are usually of a coppery hue and resemble those of measles. The mouth may show brownish scaly patches and the palms and soles may desquamate. *Soft, flat papules* are also observed, and when located about the anus and genitals they are called *condylomata lata*, the glairy secretion of which is very contagious. Bullous eruptions are not uncommon (*pemphigus syphiliticus*). Other syphilitic changes in childhood are the notched Hutchinson's teeth, a hazy ground glass appearance of the cornea, osteochondritis, and periostitis (syphilitic dactylitis). Syphilitic children have a sallow, café au lait skin. Their cry is hoarse and accompanied by snuffles. Mucous patches and stomatitis are frequently observed.

Late manifestations of congenital syphilis (*syphilis hereditaria tarda*) are found as gummatous changes in the skin and viscera, and the liver may become cirrhotic. Children of syphilitic parentage are generally *anæmic* and liable to become *rhachitic*, and they are subject to catarrh of the respiratory tract. When exposed to diphtheritic infection, they are apt to contract membranous croup.

Prophylaxis and Treatment.—Procreation should not be allowed until after two or three years of active treatment. A pregnant mother with active syphilis should have energetic treatment. A child of luetic parentage should not be wet nursed even in the absence of mucous patches in the mouth, and great care must be exercised in the management of nursing bottles and nipples. The best treatment, in the experience of the writer, is the inunction treatment with mercurial ointment reduced one half. Twenty grains are rubbed into the skin of the abdomen and loins once a day for a week, this to be repeated after a week's intermission, and again if necessary. Calomel, gr. $\frac{1}{10}$, or gray powder, gr. $\frac{1}{2}$, may also be given three times a day. Iodide of potassium is not adapted to this class of cases. The greatest care must be given to the nutrition and general health. Later in the disease syrup of iodide of iron is indicated.

CHANCROID; SOFT CHANCRE; ULCUS MOLLE

Chancroid is a contagious venereal ulcer sometimes presenting as a pimple or excoriation. The severe form is the phagedænic ulcer, which may end in sloughing and gangrene of the affected part. Chancroid may be situated anywhere on the prepuce, glans, or labia, or vagina, or within the anterior urethra. It is soft to the touch, but *from frequent irritation* and *cauterization* it may become hard and indurated, simulating the primary lesion or induration of syphilis. In urethral chancroid a sanguineous discharge appears at the orifice, and on taking the penis between the fingers a circumscribed indurated and tender spot can be felt. Chancroid is a local affection. To distinguish between a *simple* and *chancroidal excoriation* is often difficult and occasionally impossible. A *syphilitic* chancre has a cartilaginous hardness and is followed by chronic induration of the inguinal glands (bubo). Glandular induration from chancroid frequently ends in suppuration (soft bubo).

The phagedænic and sloughing chancre cannot be mistaken for the syphilitic variety.

The **prognosis** is favorable, and it takes from one to six weeks to effect a cure.

Prophylaxis is secured by personal purity or the wearing of a condom.

Treatment.—An excoriation or ulcer may be cauterized with pure nitric acid and dressed with yellow oxide of mercury ointment, gr. viij to ℥j. Should chancrous pus discharge from under a tightened prepuce, the latter must be slit open and all tension removed and the ulcer treated in the usual way. When local inflammation and swelling are pronounced, ice cold lead water should be applied to the parts.

A penis with a sloughing chancre should be bathed every two hours in warm water containing liquor sodæ chlorinatæ, 1 to 20. The promptest means of arresting sloughing and hæmorrhage is the actual cautery with an occasional incision to relieve tension. The patient should have fresh air, a generous diet, and open bowels, and 5 gtt. of dilute hydrochloric acid in water should be taken after eating, to aid digestion. Alcohol in some form may occasionally be useful for its stimulating properties.

A *bubo* requires an ice bag or hot water bag, and should suppuration set in free incision or extirpation.

Chancroid in the female is treated in the same way. Sitz baths are very serviceable, after which the labia are to be kept apart by means of lint smeared with yellow mercury ointment.

Chancroids of the lip, tongue, and other parts are treated in the same way.

GONORRHŒA IN THE MALE AND FEMALE, ADULT AND CHILD, WITH REMARKS ON ITS COMPLICATIONS AND SEQUELÆ

Gonorrhœa is a contagious mucopurulent urethritis caused by a specific germ, the gonococcus of Neisser. For the technique of its demonstration, see the chapter on Laboratory Diagnosis.

When the disease is confined to that portion of the male urethra situated in front of the compressor muscle, we speak of *anterior urethritis.* When the membranous and prostatic portions are affected, we speak of posterior urethritis. If a patient passes his urine into *two glasses,* that in the first glass will be cloudy, and that in the second glass clear if the bladder and posterior urethra are free.

Symptoms and Course of Gonorrhœa, or "Clap."—A red meatus with a scanty discharge is the first symptom. The discharge becomes thick, purulent, and greenish. The foreskin becomes swollen and œdematous. A burning or scalding sensation on urinating is complained of. Occasionally painful erections (chordee) occur. In favorable cases the discharge gradually disappears after the fourth week, but in many instances acute exacerbations or relapses occur, generally and erroneously attributed to some indiscretion in eating or drinking.

In *acute posterior urethritis* there is considerable pain and vesical tenesmus, with a marked and sudden decrease in the discharge and increased desire to micturate. Chordee and nocturnal pollutions are common, and the two glass urine test shows that all the urine is cloudy, because some of the secretions are apt to pass backward and settle at the base of the bladder.

Prophylaxis.—It is quite feasible for both sexes to remain continent until marriage. When extramarital sexual intercourse is indulged in, the safest plan is to wear a condom or to thoroughly wash the genitals after coition and inject a few drops of a 20 per cent protargol solution in glycerin, after first urinating.

Instructions to Those Having Gonorrhœa, or "Clap."—Gonorrhœa, or "clap," is a local contagious disease. To avoid infecting others and to prevent complications, a bubo, stricture, swollen testicles, etc., the following rules should be observed: 1. During the first few weeks walking should be limited. When the discharge is profuse you should keep off your feet as much as possible. 2. Do not use alcohol in any form, as it always prolongs the disease. Drink milk, tea, Vichy, or Seltzer, and from six to eight glasses of water during the day. 3. Avoid all sexual relations until you have been pronounced cured by your physician, as the disease may be given to a woman even after the discharge has apparently ceased. When it is present you should avoid sexual excitement, as erections always aggravate the disease. 4. Always wash the hands after handling the parts. The discharge, if carried to the eyes, will cause blindness. 5. Sleep alone, and be sure that no one uses any of your toilet articles, particularly towels and wash cloths. 6. Never lend your syringe to any one, and as soon as you are well destroy it. 7. Be sure that the bowels move every day. If they are inclined to be constipated, take a dose of Rochelle salts before breakfast. 8. Do not use mustard, pepper, horseradish, or stimulating sauces on your food. (Cabot.)

Treatment.—Abortive local treatment by irrigation at the onset of the trouble is highly recommended by some able specialists under the supposition that the gonococcus can be destroyed directly or destroyed and washed away as it reaches the surface from the deeper layers of the urethra. The writer's clinical experience is in accord with that of those genitourinary specialists who believe in the postponement of local treatment until after the acute stage has subsided, because the patient does not seek advice until the evidence of inflammation is present. In the mean time the patient is told to live according to the instructions given above, and ordered to take an emulsion or capsules of copaiba several times a day and drink freely of warm or cold *peppermint tea* or *Vichy water*.

After from four to six weeks of such expectant treatment one or more of the following injections may be employed for the "morning drop":

℞ Acetate of lead,	1 to 500, in water;
Sulphate of zinc,	
Sulphocarbolate of zinc,	
Alum,	
Tannin,	
Nitrate of silver,	1 to 1,000;
Cupric sulphate,	gr. v to ℥jv;
Potassium permanganate,	1 to 2,000;
Ichthyol,.	2 per cent;
Protargol,	1 per cent.

Injections are made with a blunt syringe after urinating and after cleansing the meatus. The injection fluid may be retained for some minutes by compressing the urethral orifice. Urethral suppositories of gelatin or cacao butter, containing opium, belladonna, and the various *astringents*, are serviceable. The penis may be bathed frequently in lukewarm antiseptic water.

The so called abortive treatment: The anterior urethra is washed with warm water in order to remove the accumulated discharge; an ordinary hand syringe is used for the purpose. Then 2 drachms of a 20 per cent solution of argyrol are injected into the anterior urethra and held there for ten minutes; the patient is then given a 20 per cent solution for use at home and the injection, as described above, is repeated every three hours *night and day* for two or three days; the patient reports at the office once daily for observation. This treatment is a troublesome one and expensive.

Chronic anteroposterior urethritis (gleet) is due to a more severe and deep seated inflammatory localization of the malady in one or more parts of the urethra.

Symptoms.—Shreds in the urine, a mucoid discharge, gluing together of the urethral orifice, a feeling of weight or pain in the perinæum and testicles, increased frequency of micturition, and nocturnal and painful pollutions. Such symptoms are increased by alcoholic stimulation and sexual indulgence. The patient is apt to become neurasthenic and fall a prey to the charlatan, and frequently by his incessant complaints drives the best of physicians into all kinds of harmful local treatment.

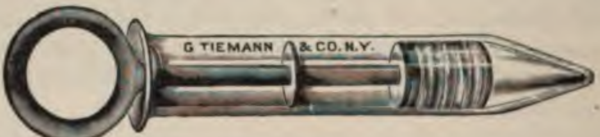

Fig. 156.—Urethral Hand Syringe, Holding One-quarter Drachm.

Treatment.—The patient should take moderate exercise in the open air and must be made to understand that he will be cured. Tonics, such as iron and arsenic, and cool sponge baths are indicated. The aforementioned astringent injections and urethral suppositories may be employed. Another plan is to irrigate with a warm saturated solution of boric acid every two or three days, after which an applicator wrapped with cotton saturated in a 20 per cent argyrol solution is passed into the urethra and moved very gently to and fro, much in the same manner as local applications are made to the nasopharynx. The patient is given a 5 per cent solution for injection three times daily, or we carefully dilate the urethra with lubricated steel sounds several times at intervals of two or three days.

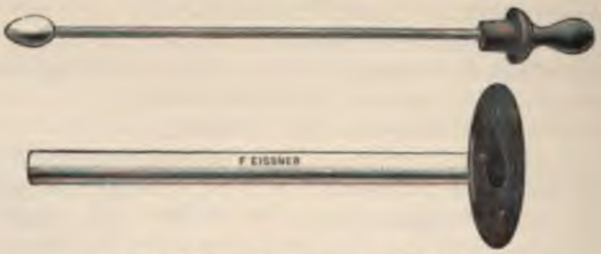

Fig. 157.—Urethroscope (Klotz).

When a local examination by means of the *Klotz endoscope* reveals granulations or ulcers, direct cauterization with a cotton carrier bearing a 2 per cent argentic nitrate solution is indicated.

If during the course of the disease the bladder has become infected, as shown by the condition of the urine and by urgent bladder symptoms, urotropin, in 10 grain doses, may be given three times a day. Irrigation of the bladder should not be practised, except in very urgent cases (see Cystitis).

The complications and sequelæ of acute anterior clap are phimosis, paraphimosis, chordee, balanitis, adenitis, and periurethral abscess.

The complications of posterior urethritis are infection of the prostate, seminal vesicles, spermatic cord, testicles, bladder, kidneys, and peritonæum, or stricture, gonorrhœal rheumatism, sexual neurasthenia, and sterility.

In the practice of *pæderasty* the rectum may become infected, resulting in ulceration and stricture, and gonorrhœa of the mouth has been observed.

Venereal Disease in the Female

Chancroid and syphilis in the female does not differ from that of the male except as regards location, and treatment is practically the same as in the male.

Gonorrhaœ in the female is dangerous on account of its sequelæ. It usually shows itself as vulvovaginitis with a sense of burning and fulness of the parts. The gonococcus is found in the purulent discharge.

TREATMENT.—Vaginal douches of warm borax water, ʒj to 1 pint, or bichloride of mercury, 1 to 5,000, or sulphocarbolate of zinc, ʒij to 1 quart, are to be employed three or four times a day, also warm sitz baths. After the acute symptoms have subsided, the vagina should be swabbed once a day with a 2 per cent nitrate of silver solution.

Complications, residual symptoms, and sequelæ in females are endometritis, tuboovarian disease, cystitis, pyelonephritis, gonorrhœa of the rectum or eye, periurethral and Cowper's gland abscess, granular vaginitis, and sterility.

In conclusion, it must be emphasized that an apparently fresh outbreak of gonorrhœa is no proof of a new infection; it is usually a manifestation of an old but *latent* infection.

For **gonorrhœa in children,** see Pædiatrics.

FUNCTIONAL DERANGEMENTS IN THE MALE

Sexual Erethism; Masturbation; Pollution

Priapism is of two kinds, one unattended by sexual desire and the other a sexual erethism of the psychical type. The former may be due to a variety of causes, such as reflex irritation from an irritable prostate, hæmorrhoids, stone in the bladder, phimosis, or central nervous disease of an organic nature. By removing the cause, if it is possible to do so, we overcome the trouble. Camphor, hyoscyamus, lupulus, and the bromides are indicated. Reflex priapism is observed after operations on the penis, and may be so urgent as to tear open sutures.

Sexual erethism of the psychical type is usually cured by cold sponging and bromides and bitter tonics.

Masturbation is practised by most boys, and *thigh friction* is nothing unusual in infants and children. Masturbation and sexual excess may result in a hyperæmic state of the sexual organs and finally lead to sexual neurasthenia.

In the TREATMENT of such cases it is important that the physician gain the confidence of the patient and impress upon his mind that masturbation is injurious only *while it is practised*, and that health will return when the habit is stopped. Cold sponge baths, bromides, and tonics are indicated. The bowels must be made to move freely.

Pollutions may take place during the day or at night, in sleep. Natural emissions may take place once a week without discomfort or injury. Too many pollutions from the fondling of women may lead to local hyperæmia and subsequent neurasthenia.

In such cases all exciting practices must be stopped, and if marriage is not possible, the company of women should be avoided. Emissions may be a sign of neurasthenia and general debility or of local disease.

TREATMENT is directed to the underlying cause. The general management is that of *Erethism*.

Sexual degenerates and perverts deserve our pity and contempt. The management of the various phenomena of degeneracy is not within the scope of this book.

Impotence and Sterility of the Male.—Functional impotence and sterility may be due to senile degenerative changes, but there is no definite period at which such changes occur; some men are sterile at fifty and in some the impregnating power remains to old age.

Functional impotence may depend upon mental non-development or upon grave disease of the central nervous system, in which event the prognosis is bad. It is, however, more frequently a *neurosis*, depending upon the mental state of the individual (bashfulness, anxiety, fear, disgust), or it is due to malnutrition or cachexia and anæmia from chronic ailments.

Aspermatism means absence of seminal fluid, which is mostly due to disease of the seminal vesicles and disappears when the vesicles resume their function.

Azoospermatism is the absence of spermatozoa in the ejaculated semen. In such cases spermatozoa may not be formed in the testicle or may not reach the seminal vesicles on account of obstruction. Azoospermatism does not interfere in the performance of the sexual act.

Prostatorrhœa is often mistaken for spermatorrhœa (spermatophobia).

The PROGNOSIS of functional impotence depends entirely upon the underlying cause. When a grave nervous lesion can be excluded in middle aged or younger men, a hopeful prognosis is indicated and demanded in order to restore self-reliance.

TREATMENT.—The general principles of the treatment of impotence in anæmic and neurotic individuals may be laid down as follows: Freedom from mental care, regular physical activity, outdoor life, regular habits, no tobacco or alcohol excess, a liberal, highly nutritious diet, cool and cold sponge baths, regular sexual approach from the opposite sex, no premature withdrawal, and removal of fear of pollution.

The following drugs may be taken: Iron, arsenic, strychnine, phosphorus, cantharides, and potassium iodide. Electricity and vibratory massage should be employed.

In cases of functional impotence in the newly married, the hymen should be ruptured by the finger. Functional impotence, it is maintained, yields frequently to the subcutaneous administration of *johimbin* (Spiegel) in a 2 per cent watery solution. The initial dose is from 10 to 15 drops, daily or every other day, until twenty injections have been taken.

Sterile Marriages.—Gonorrhœal urethritis is the most frequent cause of sterility. It is stated that about 70 per cent of sterile marriages must be attributed to the *husband*, either from azoospermia or impotence, or owing to the wife being infected with gonorrhœal disease by her male partner or partners. Noeggerath maintained that 90 per cent of sterile women were married to husbands who had suffered from gonorrhœa previous to or during marital life and that many of them had *latent specific urethritis.*

Syphilis also produces sterile marriages and is a frequent cause of abortion. In sterility due to specific urethritis or syphilis and its sequelæ the treatment of the underlying cause is the primary consideration.

CHAPTER XIX

THE GENITOURINARY SYSTEM—*Concluded*

GYNÆCOLOGICAL MEMORANDA

Synopsis: **Diagnostic Palpation, Examination with Specula, Examination of Discharges and Scrapings in the Laboratory.—*Menstrual and Functional Disorders and Neuroses.*—Constipation in Females (see Constipation).—Late Menstruation in Girls.—Amenorrhœa.—Dysmenorrhœa.—Menstrual Colic.—Intermenstrual Pain.—Iliolumbar Neuralgia.—Menorrhagia.—Metrorrhagia.—Vicarious Menstruation.—Menopause.—Sterility in the Female.—Incontinence of Urine in Females.—Vaginismus, Nymphomania, Masturbation.—*Vulvovaginal Discharges.*—Leucorrhœa, Purulent Vulvovaginitis, Gonorrhœal Vulvovaginitis, from Endometritis, from Granular Cervix, from Cancer.—*Inflammation of the Vulvovaginal Glands, Abscess.*—Flexions, Versions, Prolapse.—Treatment by Binder, Pessary, Operation.—*Laceration of Perinæum and Cervix.*—Treatment by Primary and Secondary Operation.—Fistula, Vaginovesical, Rectovaginal.—Extra-uterine Pregnancy.—Internal Bleeding.—Hæmatoma, Hæmatocele.—Pelvic Inflammation and Suppuration.—Palliative and Operative Treatment.—Benign and Malignant New Growths.—Abortion, Miscarriage.—Puerperal Sepsis.**

GENERAL REMARKS

The field of the general practitioner embraces:

I. Diagnosis of diseases of the female pelvic organs.

- *a*. Diagnostic palpation.
- *b*. Examination with specula.
- *c*. Examination of discharges, tissues, scrapings in the laboratory.

II. The knowledge and management of functional disorders and neuroses.

III. The knowledge and management of localized minor ailments of the female genitalia.

Major operations in gynæcology, particularly such work as requires strict asepsis and antisepsis, is the province of the abdominal surgeon. Prolonged local treatment for discharges by douches and tampons without inquiry into the underlying cause or condition is as reprehensible as surgical treatment undertaken without proper indication other than the vague and indefinite pain complained of by neurotic, anæmic, and constipated women.

The principles of gynæcological diagnosis are well laid down by Dr. G. M. Edebohls, of New York, in a paper read before the Clinical Society of the New York Post Graduate Medical School:

> "Gynæcological diagnosis, in its more restricted sense, is nearly synonymous with diagnostic palpation of the female pelvic organs, and the practice of the latter resolves itself virtually into the practice of the bimanual touch, or combined external and internal palpation.

"Vaginal palpation alone and rectal palpation alone have absolutely no place in modern gynæcological diagnosis, and consequently in furnishing indisputable indications for treatment.

"To illustrate: Vaginal touch suffices to establish a diagnosis of cancer of the cervix; bimanual examination, however, is necessary to determine whether the case is still an 'operable' one. The condition of the ovaries and tubes can be satisfactorily made out only by the bimanual; yet who would be willing, at the present day, to undertake the active treatment of any gynæcological case without first knowing the condition of the ovaries and tubes?

"Abdominal palpation, though by itself of little or no value in the diagnosis of pelvic disorders, cannot be dispensed with in the modern practice of gynæcology, since many conditions of the abdominal organs, notably movable kidney and appendicitis, which so often produce symptoms complicating and counterfeiting disease of the pelvic organs, can only be recognized in this way.

"We shall first speak of gynæcological diagnosis as far as it can be made by the fingers alone, without the assistance of any instrument whatsoever. As already stated, a diagnosis thus arrived at will suffice in the vast majority, certainly over 95 per cent, of all cases.

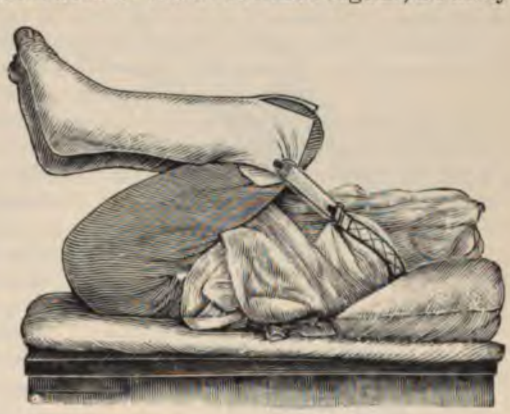

FIG. 158.—STOCKING AND STRAP LEG HOLDER IN DORSAL POSTURE.

"The practice of the bimanual touch will vary somewhat in its details according as it is undertaken in a well equipped office or hospital or at the home of the patient. The office examination, furnishing the standard of conditions under which bimanual palpation is practised to the greatest advantage, will be first considered.

"The indispensables to a satisfactory practice of the bimanual touch are a good examining chair or table and proper leg holders. Quite an array of both are in the market to suit various fancies, tastes, and purses. As for the tables, nearly every one of them will answer the purpose, the choice between them narrowing itself down to a question of appearance, of greater or less convenience, of adaptability to uses in addition to those of diagnosis, as well as of personal predilection arising from familiarity and habit. A point of some importance is to have the table of the proper height to suit the examiner, so as to avoid the fatigue of stooping and strained positions.

"Many of the leg holders or heel rests in common use are objectionable on the score of the constrained position of the patient and incomplete relaxation of her muscles. The Edebohls leg holders act on the principle of suspending the lower extremities by the ankles, with the legs and thighs flexed, the knees falling apart by their own weight. Thus every muscle of the lower extremities, pelvis, and abdomen is relaxed and the bimanual examination greatly facilitated.

"Immediately preceding each examination, the patient should empty the bladder. It is desirable, though not always as convenient, nor as imperative as in the case of the bladder, to have the rectum also empty. After removing her corset and loosening every article of apparel about the waist, the patient is ready for examination.

"The patient is then placed in position on the table, upon the back, with her buttocks at the edge of the table and her feet or legs sustained by suitable leg holders. Whether she lies with the upper part of the body somewhat elevated or perfectly flat makes little or no difference when the Edebohls leg holders are used. With other leg holders it is preferable to have the head and thorax somewhat raised. Unnecessary exposure of the person should be avoided, and the patient's feelings of modesty should receive all due respect possible under the circumstances.

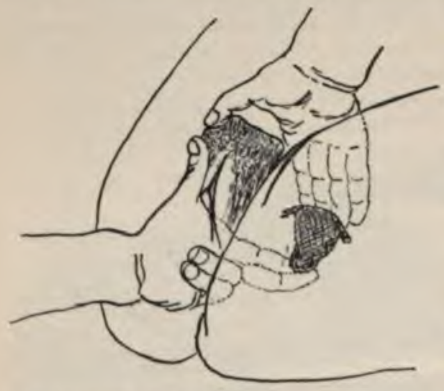

FIG. 159.—BIMANUAL PALPATION OF FEMALE PELVIC ORGANS.

First step. Locating the fundus and cervix. (After Kelly).

"The examiner now takes his position at the foot of the table, and introduces the index finger of one hand into the vagina, carrying it along the posterior wall so as to avoid the sensitive parts of the vestibule, until the cervix uteri and vaginal vault are reached.

"The fingers of the other hand are placed upon the lower abdomen in such a manner that all the organs of the pelvic cavity successively come to lie between, and are palpated by, the internal and the external fingers.

"Obstacles to successful vaginoabdominal palpation, the bimanual examination as generally practised, are a short vagina, unusually high position of the uterus and of its annexa, and a well developed panniculus adiposus. These obstacles can in nearly every case be overcome by combined rectovaginoabdominal palpation.

"In practising rectovaginoabdominal palpation the fingers of one hand are placed on the lower abdomen in the usual way. The index finger of the other hand is passed into the vagina, while the middle finger of the same hand enters the rectum. Or the thumb may be passed into the vagina and the index finger into the rectum, at the option of the examiner.

"Experience here as elsewhere is an important item, and the experienced, well oiled finger can be so deftly and gently introduced into the bowel and beyond the so called third sphincter as to give the patient absolutely no pain. The disagreeable sensation of an impending fæcal movement is the only thing complained of, and this passes away instantly the finger is withdrawn.

"By means of the rectovaginoabdominal touch the examining fingers penetrate the pelvis to a much greater depth, the perinæum being carried upward to the extent of about three centimetres upon the web between the vaginal and rectal fingers.

"To satisfactorily and completely fulfil its mission as an explorer, the rectal finger must penetrate beyond the third sphincter, the situation of which corresponds in height with that of the os internum. Under ordinary circumstances the posterior surface of the uterus, as well as the tubes and ovaries, is thus palpated with the greatest facility.

"Elevation of the pelvis, the Trendelenburg posture, by causing the abdominal viscera to gravitate away from the pelvis, will occasionally prove a useful adjuvant in the performance of the bimanual.

"The bimanual examination of *virgines intactæ* should always assume the form of a rectoabdominal palpation. There is no need in these cases of a vaginal examination; the finger in the rectum will teach us all we wish to know concerning uterus, tubes, and ovaries. The only difficulty to be overcome is to identify the cervix; a little practice will enable us to master this detail.

"An excessive deposit of fat over the lower abdomen and the buttocks forms one of the most common of the ordinary difficulties to be overcome in bimanual palpation. In this connection it is well to remember that very fat women present a transverse crease or furrow, deeply indenting the panniculus adiposus, just above the pubes. By passing the finger tips of the outer hand down to the bottom of this furrow or crease, the examination will sometimes be possible where, without this little artifice, it would fail. In any event, however, most of the fine palpatory work in fat women will have to be performed by the vaginal and rectal fingers.

"Gentle, light, and deft palpation will aid us in gaining the confidence and cooperation of our patient, and will often succeed where brusqueness and uncalled for exertion of strength will fail. By pressing so hard as to cause the patient pain we provoke the abdominal muscles to contraction in self-defense, and thus directly defeat our purpose, besides exhausting the muscles of forearms and fingers and blunting our sense of touch.

"The sense of touch, the *tactus eruditus*, is the gynæcologist's stock in trade. Without it he could no more pretend to practise gynæcology than a blind man could practise ophthalmology. A finely developed *tactus eruditus* is not to be looked upon as an innate gift; it is solely the result of daily, patient, and painstaking cultivation.

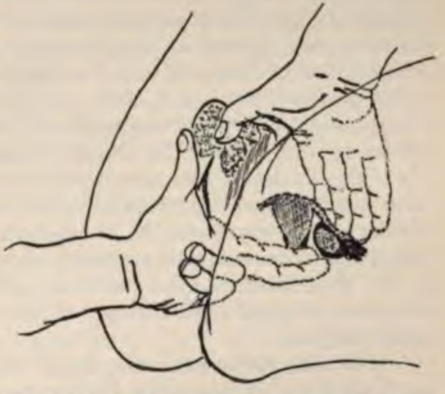

FIG. 160.—BIMANUAL PALPATION OF FEMALE PELVIC ORGANS.

Catching the appendage between the tips of the opposing fingers.

"A first examination of a patient at her house should never be made with her in bed unless her removal would be attended with risk. A firm table, strong enough to bear the patient's weight, is our first choice. In lieu of that, the head end of an ordinary sofa may be used to support the patient's buttocks, her back and head resting upon pillows appropriately disposed upon the body of the sofa. With the patient's knees separated and drawn up toward her face and held there by her own or by a friend's hands, an excellent posture for the practise of the bimanual touch is obtained.

"Occasionally, though less and less frequently with increasing experience, examination under narcosis becomes necessary in order to establish a satisfactory diagnosis by bimanual palpation. It is scarcely necessary to add that when the patient submits to the unpleasantness and risk attending the administration of an anæsthetic, she has a right to expect that the verdict reached shall be final, and that, therefore, only a thoroughly competent examiner should officiate on the occasion.

"The examiner will occasionally avail himself of the relaxing effects of the hot bath to overcome excessive rigidity and hyperæsthesia of the abdominal walls, the examination being made immediately *after* the emergence of the patient from the bath.

"Before we proceed to the consideration of the pathological conditions of the female pelvic organs recognizable by bimanual palpation, it may be well to describe briefly the normal findings.

"Under favorable conditions, with proper posturing of the patient, bimanual examination should furnish us a clear picture or conception of the size, position, consistence, etc., of the following structures and organs: Anus, vulva, vagina, urethra, bladder, the lower five to six centimetres of the ureters, the rectum to beyond the third sphincter, cervix, uterus, tubes, ovaries, pelvic cellular tissue and peritonæum, walls of the pelvis, and the broad, round, and uterosacral ligaments.

"Palpation of the ovarian ligaments is often a difficult matter, although of the greatest importance and almost pathognomonic significance in the diagnosis of small ovarian tumors.

"In making gynæcological examinations it is well to accustom one's self from the very beginning to a certain system or order, as regards both the examination itself and the record thereof. The general custom is to begin with the perinæum and to examine and record in ascending order the condition of the organs and structures enumerated above. The real examination, however, begins with the tubes and ovaries in all cases in which these structures can be reached and defined. The condition of the tubes and ovaries is of such essential and prime importance in diagnosis, prognosis, and the formulation of therapeutic indications that we cannot afford to forego exact knowledge thereof in any case.

"The findings on examination are then noted and recorded, beginning with the ovaries and tubes. The fundus of the uterus, our guide to the tubes, and along these to the ovaries, is the first thing sought for by the palpating internal and external fingers. The promontory of the sacrum is the next point to be located. It forms the principal landmark in the determination of dislocations of the uterus, tubes, and ovaries, as well as of their degree.

"Having introduced the finger or fingers to the proper depth in vagina, or vagina and rectum, the abdominal wall is depressed by the fingers of the external hand until the finger tips of one hand recognize, or practically meet, those of the other behind the uterus. This presupposes, of course, a uterus not enlarged by pregnancy or the presence of a tumor and not impacted in retroversion in the pelvis. We are now ready to proceed to the palpation of tubes and ovaries, and with this palpation, as already stated, begins the examination proper.

"Palpation of the ovaries is best accomplished by following the tube from the uterine cornu outward to the ovary. This will sometimes prove impossible of accomplishment from the vagina, on account of inelasticity, thickening, or senile atrophy of the vaginal walls. Examination per rectum will enable us to overcome all difficulties of this sort, and to recognize with the greatest distinctness normal sized tubes and ovaries, especially when prolapsed backward with a retroverted fundus uteri. Indeed, by artificially dislocating the fundus backward by pressure with the fingers of the outer hand we can, in practically all cases, bring the ovaries and tubes within easy reach of the rectal finger.

"Having satisfied ourselves that the ovaries are normal in size, we next test them for sensitiveness on pressure. In doing so we must avoid being deceived by the presence of a lumboabdominal neuralgia as denoted by a Valleix point in the anterior abdominal wall near the median line. In distinguishing we shall remember that in mural neuralgia the pain on pressure is very localized and is elicited by pressure of an external finger alone; while the pain of oophoralgia or oophoritis is elicited by pressure of the internal finger or, better still, by compression of the ovary between the inner and outer fingers. Tenderness of the appendix vermiformis may, in rare instances, prove difficult to discriminate from ovarian pain on pressure. Palpation of the appendix from without will eliminate this possible source of error.

"A calculus lodged in the lower end of either ureter may be mistaken for a cirrhotic ovary. The diagnosis is cleared up by determining the presence or absence of a normal ovary on the same side with the doubtful hard body.

"In all tumors of suspected ovarian origin the diagnosis can be made absolute only by determining the relations of the ovarian ligament to the tumor. When this ligament can be distinctly traced running from the uterus on to the tumor, we know the tumor must be ovarian. This is, however, by no means always an easy task, even when we resort to artificial dislocation of the uterus either upward into the abdomen or downward toward the pelvic outlet. The recognition of a normal ovary beneath or alongside of a pelvic tumor of doubtful origin will of course enable us to exclude ovarian tumor.

"Palpation of the normal sized Fallopian tubes is to-day the common property of all thoroughly trained physicians, and offers no difficulties under ordinarily favorable conditions. The tubes are felt between the internal and external fingers as rounded cords extending from either cornu uteri outward to the pelvic wall. The direction of the outer half of the tubes serves to distinguish these organs from the round ligaments; the relative position of the two structures also aids in their distinction.

"Perfectly normal tubes are non-sensitive on pressure, even as the healthy uterus itself. When the fingers recognize a normal sized tube, sensitive on pressure, while an equal degree of pressure immediately above and below the tube fails to elicit pain, the diagnosis of salpingitis, probably catarrhal, must be made. Reasoning backward from the salpingitis, a causative endometritis is the logical deduction, even though all the other usual symptoms of the latter are absent. In the absence of contraindications, curettage and drainage of the uterus are the measures called for.

"In cases of movable retrodeviated uteri, exact palpation of the tubes and ovaries is sometimes more easily accomplished after lifting the fundus forward bimanually.

"In the severer forms of salpingitis the ovaries, pelvic peritonæum, and adjacent organs are generally more or less involved. An attempt to describe the almost endless variations in the physical signs produced by these complications would lead us too far.

"Whenever the tubes, in these complicated conditions, form the focus or starting point of the inflammatory process, and yet are not of themselves very greatly enlarged, it becomes a matter of practical importance to determine, if possible, whether the tubes maintain their normal direction, running straight outward from the horns of the uterus, or whether they are prolapsed backward into Douglas's sac, spiral in their course, club-shaped, or very irregularly thickened. Under the first named circumstances curettage and drainage of the uterus, followed by an energetic ichthyol therapy, might still lead the case to a favorable termination, while with the last named conditions present more radical measures would be indicated.

"A tubal tumor can, in most instances, be diagnosticated by bimanual palpation, more especially if we succeed in recognizing the ovary of the same side. The diagnosis as to the character of the tubal tumor, whether it be hæmato-, hydro-, or pyosalpinx, tubal pregnancy, tuberculosis, actinomycosis, cancer, or other malignant tumor, cannot, however, be made with any approximation to certainty by bimanual touch alone. If a tubal tumor is suspected, the examination should be conducted as gently as possible, the possibility of rupture during manipulation being constantly borne in mind.

"The diagnosis of occlusion of the abdominal end of the tube may occasionally be prognostically, as well as therapeutically, of practical value. This diagnosis becomes probable when the outer end of the tube can be felt as a club-shaped enlargement with adhesions to neighboring parts.

"The various uncomplicated displacements of the uterus are readily recognized on bimanual palpation, especially by the rectovaginoabdominal touch. In this connection the various physiological displacements of the uterus, due to overdistention of bladder or rectum, as well as to the posture of the patient, must not be lost sight of.

"*Quite a different matter is the diagnosis of displacements of the uterus* when these displacements are the result of disease processes outside of the uterus itself. The uterus may be dislocated in any and every direction by tumors of adjacent viscera, by para- and perimetritic exudates, scars, and adhesions.

"It is often extremely difficult to recognize the uterus when buried in the conglomerate pathological masses thus produced. Our chief aids in the discovery of the uterus, under these circumstances, will be the recognition of the continuity between cervix and body, as well as the form, size, and consistence of the uterus itself. This peculiar consistence of the uterus, under varying conditions, can only be learned from considerable experience and is almost impossible to describe. A knowledge thereof is of invaluable aid in diagnosis.

"The rectovaginoabdominal touch will furnish valuable information regarding the presence or absence of adhesion in cases of retroversion of the uterus. The therapeutic indications in a given case will depend upon this information.

"Inversion of the uterus is completely and satisfactorily diagnosticated by bimanual palpation. A depression is felt where the fundus uteri should be, and the tubes and ovaries are recognized arising from the depths of the depression.

"The diagnosis of tumor of the uterus by bimanual palpation is easy in those cases in which the continuity of cervix or corpus with the tumor, or the connection of the tumor with the uterus by a pedicle, can be traced. Failing in this, we must have recourse to other diagnostic aids: contour and consistence of the tumor mass, the history of the case, etc.

"Many forms of developmental anomalies of the uterus are recognizable by bimanual touch. Thus, the most frequent and practically important form of arrest of development is manifested by the coexistence of a large cervix and a small corpus, with probably undersized tubes and ovaries.

"A uterus unicornis is recognized by normal insertion of the tube and round ligament on one side, while on the other side these structures are inserted into the uterus at the level of the os internum.

"The diagnosis between a double uterus and a tumor connected with a single uterus is made by tracing the tubes. If these originate from the outer side of either mass, we have a double uterus to deal with.

"In the diagnosis of diseased conditions of the cervix we are not dependent upon palpation alone; the sense of sight may be brought to our aid. Nevertheless, the various pathological states affecting the cervix uteri, hypertrophy, elongation, lacerations, ectropium mucosæ, inflammation, polypus, carcinoma, etc., may all be recognized and distinguished with absolute certainty by the trained finger alone.

"Hegar's sign, the compressibility of the lower segment of the uterine body, as demonstrated by the bimanual touch, is, in the hands of the expert, a pathognomonic sign of pregnancy in the early months. A note of warning in the examination of cases of suspected pregnancy is in order, for it is known that the bimanual, *too vigorously applied*, may produce abortion, no instrument whatsoever having been used.

"The female bladder can be outlined throughout its whole extent and the presence within it of a tumor, concretions, or foreign body can be determined by the bimanual touch.

"With the bladder empty, the lower five to six centimetres of the ureters may be palpated, and dilatations and thickenings of that canal, as well as concretions within it, can be distinctly felt. The importance of these findings from a diagnostic point of view can scarcely be overestimated.

"Regarding the diagnosis by palpation of the various pathological changes in the pelvic cellular tissue and the pelvic peritonæum, parametritis, perimetritis, hæmatoma, and hæmatocele, I will merely call attention to two points of great practical importance upon which sufficient stress is not usually laid. The first is the fact that in a first attack of acute peritonitis, pelvic or general, in a woman, our earliest positive diagnostic sign consists in a sense of fulness and fluctuation in Douglas's sac, easily recognizable by vaginal or, better, by combined rectal and vaginal touch. The second relates to cases of carcinoma of the uterus; if the sacral glands can be felt to be even slightly enlarged and tender, the case, no matter how favorable the other conditions may be, is probably beyond the help of operation.

"An examination with a *bivalve, cylindrical*, or *Sims* speculum is made in the dorsal or left lateral position. It reveals the appearance of the parts which can be brought to view and the character of the discharge if present. The *uterine sound* may be used for determining the depth of the uterus and the course and patency of the cervical canal. Its employment for diagnostic purposes is indicated only in very exceptional cases, and great care must be taken to avoid sounding a gravid uterus by mistake, and to avoid injury and infection of the uterus by the use of an unclean sound or forcing inward of septic material from the vagina and cervical canal. In sounding the uterus asepsis must be as perfect as for major operations.

"*Exploratory puncture of the female pelvic organs* through the vaginal walls or abdominal parietes for the purpose of establishing the presence or absence and the character of pus, blood, cystic fluid, etc., in deepseated, fluctuating swellings is rarely called for. This method is not for universal use, and is safe only in the hands of an experienced diagnostician. If the physician has reason to suspect the presence of recent venereal infection, in the case of the patient to be examined, a rubber glove should be worn—a finger cot will *protect the finger* only. *Scrapings* and *discharges* should be collected in wide mouthed bottles for laboratory diagnosis. Too much reliance should not be placed on microscopical diagnosis.

"Palpation of the female pelvic organs, although it may have revealed to us minutely and satisfactorily the condition of these organs, is insufficient in itself for a diagnosis complete enough to satisfy the demands of modern gynæcology. The entire abdomen calls for careful palpation, especially with reference to the so frequent and important conditions of movable kidney and appendicitis. The other important organs of the body, heart, lungs, kidneys, and brain, must also be interrogated for evidences of disease. Even when we have thus gone over the whole field, and recorded the results of our physical examination, the diagnosis is not complete. The establishment of a scientific diagnosis calls for an analysis of the subjective symptoms of the patient, with the view of harmonizing them with the objective signs. In other words, each prominent symptom complained of must be traced to its source, and analytically referred to its causative condition, the latter having been determined by physical examination. Only after this is done and the indications for treatment clear, are we able to act intelligently in the attempt to help our patient. This forms a high standard of practice, but progressive modern medicine and modern gynæcology are satisfied with nothing less at the present day."

MENSTRUAL DISORDERS

Menstrual Condition of the Average Girl in Average Health.—The late Dr. George J. Engelmann, of Boston, has presented an interesting statistical paper on this subject, and the facts presented by him were culled from the records of forty-eight hundred and seventy-three cases from high and normal schools, colleges, and department stores. The girls were between fifteen and twenty-six years old, the majority between eighteen and twenty-two, in rather better than average health—in good health—and in numbers sufficient to admit of positive deductions as to what may be termed normal or average menstruation.

The average period of the average girl in average health presented very different features: Regularity in 50 per cent of the cases only; recurrence every twenty-eight days in 30 per cent, varying most frequently from twenty-six to forty-two days, 45 per cent being over twenty-eight. The duration varied from two to seven days, average 4.6. From 66 to 70 per cent suffered more or less, the number of sufferers varying, according to age and nature of occupation, between 30 and 90 per cent. Lessened ability for exertion, mental or physical, was admitted by 60 per cent. Some few were habitually incapacitated from work, and 30 per cent occasionally. The function of the girl in good health, under modern conditions of life, was by no means an ideal one in the judgment of the essayist.

Amenorrhœa, or absence of menstruation, between puberty and the menopause, and late menstruation in girls, are not of infrequent occurrence. In the unmarried they are due chiefly to anæmia or chlorosis and grave wasting diseases, such as phthisis. In the married or unmarried they may be caused by non-development or atrophy of the generative organs, nervous affections, change of climate, increasing obesity, and removal of the ovaries and tubes. Absence of menstruation is normal during pregnancy and lactation.

Emansio mensium (a term applied to those cases in which menstruation has never appeared) is generally free from any symptoms; *suppressio mensium* is usually accompanied by the symptoms of the disease which causes it. The patients often complain of a feeling of fulness in the pelvis; of headache, flushes, and general nervousness.

The TREATMENT of functional amenorrhœa in absence of imperforate hymen consists of *hydrotherapy* and judicious exercise. The cool douche is efficient, also massage and vibratory massage. The diet should be liberal and digestion may be aided by giving five drops of dilute hydrochloric acid, in water, after meals. The bowels should move once a day. In anæmic conditions, iron, bromomangan, iron tropon, and arsenic are indicated. A sea voyage is beneficial, and in some instances the administration of 5 grains of powdered thyreoid gland twice daily has been followed by the desired results. In *general obesity* the management for obesity must be rigidly carried out. When the usual rational means of treatment fail to establish the evidence of the functional activity of the pelvic viscera, a careful examination is indicated, preferably from the rectum, in the case of intact virgins. Should a retention of menstrual fluid be due to an imperforate hymen, the latter must be incised.

Menstrual Colic; Dysmenorrhœa; Intermenstrual Pain; Lumbar Neuralgia

Dysmenorrhœa is not a disease *per se;* it is simply pelvic pain or colic associated with pelvic congestion and is a symptom common to numerous diseases.

Dysmenorrhœa therefore may be local or pelvic, general or constitutional, or reflex in origin. Thus, we find dysmenorrhœa in neurotic and hysterical women, in anæmic, undernourished, and constipated women, in chronic malarial poisoning, in stenosis of the os or uterine canal, in imperfect development of the uterus (small body and large cervix), in flexions and malpositions of the uterus, in uterine and pelvic tumors (fibroids), and in circulatory disturbances (heart disease).

The purely neuralgic form of dysmenorrhœa may be of the nature of an autointoxication from intestinal putrefaction, for it is well known that certain toxic substances have a predilection for irritating certain nerve tracts, a fact which is frequently overlooked in the therapeutic management of all forms of neuralgia.

Dysmenorrhœa, therefore, is produced in various ways by various pathological conditions and by a combination of some or all of these conditions, and the therapeutic management of a case of dysmenorrhœa must be the outcome of a careful study and analysis of the underlying pathological condition.

TREATMENT.—The palliative treatment comprises hot applications, prolonged hot sitz baths, rest in bed, hot drinks, hot bags to the lumbar spine, and antipyrine. Dilatation of the cervix brings temporary relief, but this is seldom permanent. The interim treatment of dysmenorrhœa will consist of hydrotherapy, exercise, massage, vibratory massage, and tonic medication.

Intermenstrual pain and **iliolumbar neuralgia** require painstaking investigation as to their origin. Hydrotherapy, attention to the bowels, and wearing an abdominal supporter are usually indicated.

Menorrhagia, or prolonged or excessive menstrual flow, and **metrorrhagia,** or hæmorrhage from the uterus occurring independently of menstruation, may be the result of general and local causes; thus, violence of emotion and sexual excitement, diseases of the heart, lungs, and liver, endometritis, retained secundines, subinvolution of the uterus, tumors of the uterus, fibroid and cancer, and fungous granulations of the endometrium. Extrauterine pregnancy is usually associated with irregularities of menstruation. At puberty menstruation is frequently scanty, delayed, or omitted.

Irregularities during the middle period of married life are quite common among those who have been repeatedly pregnant and have had household cares in abundance. It is of great importance that such cases should be carefully followed and the presence of disease of more or less serious character discovered in time to treat it effectually. Myoma uteri at such a period is most likely to be troublesome, and the effort should be made to distinguish it from malignant disease at the earliest moment. Irregularities due to the presence of fissured or lacerated cervix are often relieved by amputation of the cervix. Women with the hæmorrhagic diathesis may show purpuric spots at the time of profuse bleeding.

The TREATMENT should be directed against the individual causes. Hæmorrhages resulting from endometritis, retained secundines, and fungosities usually yield promptly to *curetting of the uterine canal.* In the absence of local disease, rest in bed and the general hygienic management outlined under amenorrhœa are indicated. A lax abdomen should be reenforced by wearing an abdominal support. Absence from home and home cares is often curative in this class of cases. Fluid extract of ergot and gossypium, 20 drops of each, twice a day, may be given empirically in undue hæmorrhage from the uterus. A very excellent hæmostatic is hydrochloride of hydrastinine, gr. $\frac{1}{3}$, three times a day.

By **vicarious menstruation** is understood a periodical discharge of blood from some part of the body other than the interior of the uterus. The exact cause of this condition is not known; diseases of the blood or its vessels seem to play an important part in the ætiology. The treatment is symptomatic.

The Menopause and Premature Menopause

The fallacy that the *change of life* is a critical and dangerous time is still a widespread opinion and ranks with teething as an all round ætiological factor for various derangements. Nervous and vasomotor disturbances are common enough in the menopause period, but they respond admirably to the suggestion therapy and general hygienic measures. In cases of dire necessity bromides may be offered with a view of subduing the excitability of the quasi patient.

Hæmorrhage during the menopause, if frequent, is usually an evidence of a diseased endometrium and occasionally a sign of malignant disease. The differential diagnosis between simple, carcinomatous, syphilitic, and tuberculous endometritis is by no means easy, because a microscopical diagnosis in the hands of the inexperienced is not to be relied upon. Curettage for diagnostic purposes is a legitimate and proper procedure in all doubtful cases. As soon as the causation of hæmorrhage has been definitely established, the treatment is self-evident. Empirical medication for uterine hæmorrhage is mentioned under Menorrhagia and Metrorrhagia.

Cases of complete and rather sudden and early **cessation** of menstruation are occasionally observed in the absence of local disease of the generative organs. In such instances we may assume that the lesion is located higher up in the nerve centre controlling the menstrual function.

The TREATMENT of this condition will be in accordance with the underlying condition, if it can be detected. The usual hygienic management is indicated. Vibratory massage over the pelvic organs may be tried, also the internal administration of powdered thyreoid gland, 5 gr. twice daily. In anæmic women iron, arsenic, phosphorus, and a generous diet are to be recommended.

INCONTINENCE OF URINE IN THE ADULT FEMALE

This condition is met with occasionally in two forms: with the first the patient has no desire to urinate, but finds that her clothing is wet after sneezing or coughing; with the second form there is a desire to urinate and there is an attempt to control it, but the flow of urine takes place suddenly.

The causes which lead to incontinence are many. We are apt to find it associated with nervous disorders, trivial and grave, with prolapse of the bladder, rectum, or uterus, with general enteroptosis, after forcible dilatation of the urethra, with calculi and polyps within the urethra, or with tuberculosis of the bladder and congenital malformations.

The TREATMENT of this condition must be directed to the underlying cause. The cold douche, wearing an abdominal binder, electricity, and massage should be tried. In suitable cases operative procedures are called for.

STERILITY IN THE FEMALE

In primary sterility, in which pregnancy has never occurred, the husband is to blame in about one case out of four (faulty semen). The term secondary sterility applies to women who have been pregnant once and fail to become pregnant again.

Causes.—Dr. Brothers, of New York, states that in 180 women who were considered responsible for the trouble the causes of the sterility were classified as follows:

GENERAL CONDITIONS:		
Obesity,	7	CASES.
Alcohol and morphine habit,	1	
	—	8
PELVIC PERITONÆUM:		
Pelvic abscess,	1	
Pelvic tumor (?),	3	
Pelveoperitonitis,	14	
	—	18
ANNEXA:		
Undeveloped ovaries,	6	
Ovarian tumor,	9	
Salpingo-oophoritis,	28	
Pyosalpinx,	7	
	—	50

Cervix and Uterus:		
Pinhole os,	5	CASES.
Conical cervix,	1	
Stenosis of cervical canal,	22	
Undeveloped uterus,	14	
Retrodisplaced uterus,	22	
Anteflexed or anteverted uterus,	7	
Prolapsus uteri,	2	
Fibroids,	5	
Endometritis and endocervicitis,	15	
	—	93
Vulva and Vagina:		
Unruptured hymen,	1	
Vaginal bands,	1	
Vaginismus,	3	
Gonorrhœal vaginitis,	6	
	—	11
Total,		180

The **management** of sterility of the female will depend entirely upon the underlying cause and should not be undertaken without prior examination of the male. In those cases in which a lesion can be definitely located and is accessible, the prospect of a desired pregnancy is offered by means of minor or major operative measures, under antiseptic precautions.

When sterility is due to general debility in the female and errors in the male, surgery upon the female will not assist nature. The legitimate cases for treatment of the sterile condition are those of women with stenosis of the mouth of the womb, but with sound ovaries and tubes and the pelvis free of gonoccoci.

The Effect of Castration on Women.—The natural menopause closes the natural mission of the woman, and in the majority of women who have been castrated the sexual impulse abates in intensity much sooner than after a natural menopause, and in some cases wholly disappears.

VAGINISMUS

This is a painful spasm of the muscles surrounding the lower part of the vagina and the vulva, occasionally observed in newly married neurotic women with a rigid hymen, urethral caruncle, ulcer, fissure, or some inflammatory condition around the vulva.

Treatment.—Remove the underlying cause and suggest to the sufferer the feasibility of overcoming the difficulty by will power. Dilate the vagina if necessary under narcosis. A vaginal suppository of opium, belladonna, and cocaine, introduced half an hour before sexual intercourse, is efficacious, as are also local applications of 4 per cent cocaine solution to the vulva.

Masturbation.—The production of a venereal orgasm by the hand and other artificial means is called *masturbation*. Local cleanliness, the removal of local irritation (constipation, worms), moral and hygienic management, the avoidance of bad companions and literature, and the exercise of will power are the means of overcoming this evil.

Nymphomania is a morbid irresistible impulse to satisfy the sexual appetite peculiar to the female sex. When it is of a purely neurotic type without local disturbances, it requires tactful and stern measures such as will suggest themselves to the guardian or physician of the afflicted.

VULVOVAGINAL DISCHARGES

A vaginal discharge is not always a sign of disease of the pelvic organs. It is frequently met in patients suffering from heart, blood, or lung disease, in pregnancy, as a result of uncleanliness or trivial local irritation, and in anæmic and constipated girls and most married women. Patients troubled with a vaginal discharge usually complain of backache, a feeling of heat in the vagina, vesical or rectal irritability, more or less severe itching, general debility, etc. On inspection the vagina is found to be red, perhaps granular or cystic in places. The discharge is either mucopurulent (leucorrhœa), purulent (gonorrhœa (?)), or hæmorrhagic (neoplasm (?)). A careful examination of the discharges which do not yield to mild measures should always be made, as it may reveal the presence of gonorrhœal infection or incipient malignant disease.

Treatment.—Simple leucorrhœa yields to cleanliness, attention to the bowels, and general hygienic management. Occasionally medicinal tonics, such as iron tropon and bromomangan, are indicated in anæmic and debilitated women. In *purulent, non-specific leucorrhœa* more local treatment in the way of douching is indicated in addition to the above mentioned measures. A douche of sulphocarbolate of zinc (ʒ j to the pint) or of sulphate of zinc and acetate of lead combined (ʒj) should be employed twice or three times a day, to be followed by a sitz bath. Ichthyol may be used as a douche in 5 per cent solution and in the form of 5 grain rectal suppositories. Swabbing the vagina with 2 per cent nitrate of silver solution at intervals of two or three days may assist in reestablishing a healthy action of the vaginal mucosa. Sexual intercourse should be interdicted pro tempore, on account of the undesired irritation of the parts and the danger of setting up a non-specific urethritis in the male. In leucorrhœa and backache a supporting belt should be worn.

Gonorrhœal discharges in the female require all the aforementioned precautions and treatment until a cure is effected. An abatement of acute symptoms is not a sign of a cure. Recrudescence of symptoms is more the rule than the exception, as gonorrhœal infection may be dormant and latent in the female, as in the male (see also Venereal Disease).

Endometritis and Vaginal Discharges.—Inflammation of the uterine mucosa may have its seat in the body of the uterus or in the cervical lining. Infection of the uterine cavity may come about in the same way as in the case of other cavities with an open outlet. Sexual contact, unclean fingers and instruments, and the manipulations incident to parturition and abortion are among the causes to be emphasized.

The SYMPTOMS of an acute attack are dull, aching pain, irritability of the bladder, a purulent discharge, tenderness on palpation, and a fever temperature.

The TREATMENT of acute endometritis is rest in bed, vaginal douches of warm water, free catharsis, liquid diet, and a hot water bag to the abdomen. Opium and belladonna, gr. ½ each of the extract, in the form of suppositories, may be applied once or twice a day, to relieve pain. Curettage is not indicated in acute endometritis. Rectal suppositories of ichthyol, 5 grains to each suppository, may be employed.

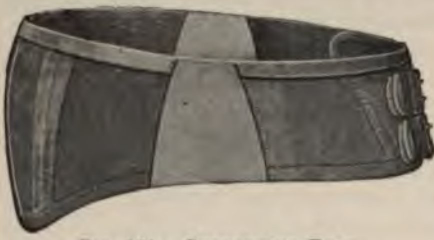

FIG. 161.—SUPPORTING BELT.

Chronic endometritis may follow an acute attack or may develop insidiously from malposition, laceration, and fibroid degeneration of the uterus or from gonorrhœal and syphilitic infection.

The SYMPTOMS are dull pain in the back and thighs and a purulent and often blood streaked discharge. Digestive and nervous disturbances set in, and the patients are undernourished, lose weight, and suffer from secondary anæmia and frequent headaches.

PHYSICAL EXAMINATION reveals an enlarged and tender uterus, a patulous cervical canal, and erosions and granulations at the os. The characteristic discharge may be seen escaping from the uterus.

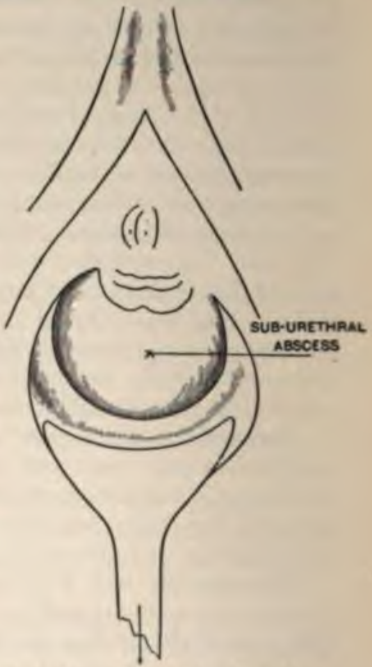

FIG. 162.—(H. A. Kelly, Med. News, 1897).

The TREATMENT of this condition will depend upon the underlying cause. The first requisites are the wearing of an abdominal binder and attention to the bowels. Marked malposition *may* require correction by operative means, not by pessaries.

Moderate outdoor exercise and removal from care and worry are important factors. The appetite should be stimulated by taking hydrochloric acid and bitter tonics combined after eating. Bromomangan, iron tropon, and other so called tonics are indicated. In chronic cases *curettage* under anæsthesia and antiseptic precautions should be performed for the removal of granulations, which are always present. When *syphilis* is suspected as an underlying cause, iodide of potassium should be given on trial.

INFLAMMATION AND ABSCESS OF THE VULVOVAGINAL GLANDS

Inflammation of Skene's Glands.— Skene's glands run parallel to the urethra. The external orifice is found in the labium urethræ. Inflammation of these glands from gonorrhœal or other infection results in swelling and tenderness to the touch. In walking or sitting the patient experiences much discomfort, but as a rule there is no pain on urination, as in simple or specific urethritis.

TREATMENT.—Pressure and massage of the inflamed gland in order to empty it of its contents are often efficacious. In the event of abscess formation an incision may be made through the anterior vaginal wall into the abscess.

Inflammation and Cyst of Bartholin's Glands.—Bartholin's glands are situated one on either side of the introitus vaginæ. Inflammation of these glands from gonorrhœal or other infection causes considerable local discomfort, pain, swelling, and a sensation of heat and throbbing. An abscess frequently forms. An early incision gives prompt relief. The incision is best made in the lower part of the swelling. The cavity may be scraped and irrigated and packed with gauze to favor healing by granulation and prevent recurrence. In chronic abscess the entire gland may be dissected out.

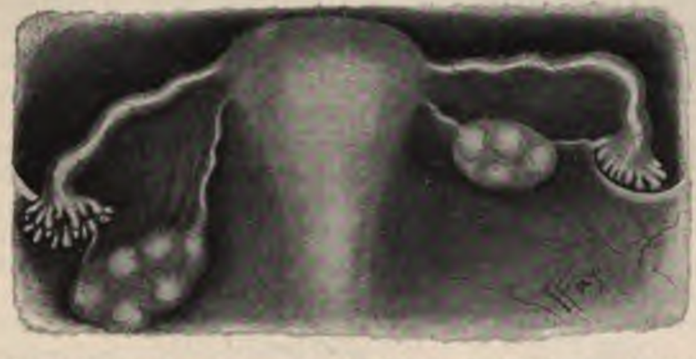

FIG. 163.—PROLAPSE OF THE OVARY (C. C. Barrows, Med. Record, 1904).

Retention cysts of Bartholin's gland require evacuation, packing, or extirpation.

PROLAPSE AND MALPOSITIONS OF THE UTERUS AND OVARIES

Prolapse of the Uterus, Ovaries, and Bladder

The uterus and ovaries have no absolutely fixed position, and slight deviations from the imaginary normal position must not be regarded as an object for treatment.

Retroversion and **retroflexion** are usually associated, the chief causes of backward displacement being childbirth, traumatism, pelvic adhesions, and that general laxity of the abdominal organs which we term enteroptosis.

The SYMPTOMS are practically those that have been mentioned under simple leucorrhœa, and bimanual palpation will reveal the condition.

TREATMENT.—If a well fitting abdominal binder fails to overcome the symptoms for which the patient seeks relief, operative interference may be indicated—ventrofixation or shortening of the round ligaments (Alexander's operation). The wearing of a pessary or tampon for the correction of a malposition is unsatisfactory and obsolete in view of the safety of operative measures.

Prolapse of the Uterus.—Prolapse may vary from a slight sinking of the organ to complete protrusion. Childbirth, laceration of the perinæum, and the various causes mentioned under flexions are the causes of prolapse.

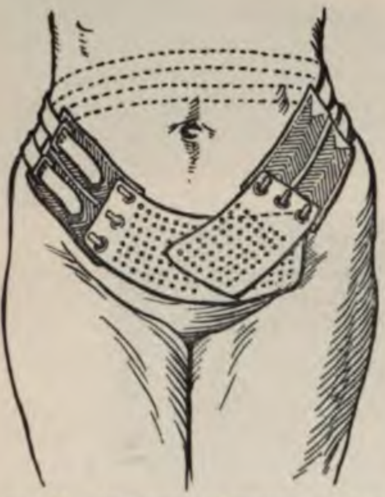
FIG. 164.—ABDOMINAL SUPPORT OF PLASTER AND WEBBING (Schmitz).

The SYMPTOMS are the same as in other malpositions, combined with more marked vesical irritation. Complete prolapse may be mistaken for inversion of the uterus or for a polypus.

The TREATMENT is operative if an abdominal binder fails to give relief.

Prolapse of the Ovary; Hernia of the Ovary.—Ovarian prolapse occurs from the same known and unknown causes which influence the position of all the other pelvic viscera. We speak of prolapse when the ovary rests deep in Douglas's pouch, such cases being associated generally with retrodisplacement of the uterus.

The SYMPTOMS are the usual ones, such as backache, a dragging sensation in the groins, thighs, and pelvis, neuralgic pains, nauseating pains, and pain on coition.

The DIAGNOSIS is readily made by bimanual palpation.

TREATMENT.—When the wearing of an abdominal binder and general hygienic management are not followed by a cessation of annoying symptoms, shortening of the round ligaments or other operative measures may be adopted for the purpose of anchoring the ovary in a better position. Hernia of the ovary into the inguinal canal or labium majus may necessitate the wearing of a truss or operative closure of an existing aperture.

Prolapse of the Bladder.—In cases of lax vagina following pregnancy the bladder may prolapse with the anterior vaginal wall, in the form of a well defined boggy sac. When annoying symptoms result from such displacement, plastic operative measures, such as colporrhaphy, are indicated.

LACERATION OF THE PERINÆUM AND CERVIX

Lacerations of the perinæum from childbirth may be slight or involve the anal sphincter. Subcutaneous lacerations of muscle and fasciæ are also observed. These injuries should be repaired by primary perinæorrhaphy. When this is not feasible or has been neglected, the operation may be performed at any subsequent time. Lacerations of the *cervix uteri* are of frequent occurrence during the first confinement. They may be unilateral or bilateral. The symptoms are leucorrhœa, hæmorrhage, and pain.

The DIAGNOSIS is made by palpation and inspection. The most effective treatment is amputation of the cervix.

Fistula, Vaginovesical and Rectovaginal.—Fistulæ are usually the result of labor. In vesicovaginal fistula incontinence of urine may be constant or not, according to the position of the lesion. Local irritation and inflammation may result from the action of the urine.

In rectovaginal fistula flatus and fæces are passed into the vagina.

The TREATMENT of such conditions is by plastic operations.

ECTOPIC GESTATION

Ectopic gestation may be recognized by the following classical symptoms:

Symptoms.—The usual *symptoms of pregnancy*, Hegar's sign, nonappearance of menstruation, severe pain in the lower part of the abdomen on the affected side, repeated paroxysms of pain at intervals of days, loss of black blood or membrane following attacks of pain, supposed to be a menstrual flow, collapse in case of rupture and internal hæmorrhage, marked anæmia and a faint pulse, fainting spells. Bimanual palpation reveals an enlarged uterus and free or clotted blood (*hæmatoma*) in Douglas's cul-de-sac in case of rupture.

The above mentioned signs and symptoms are pathognomonic of extrauterine pregnancy, but an error in diagnosis is possible, nevertheless, owing to irregular enlargement and retroflexion or sacculation of the gravid uterus or simultaneous gestation within the uterus and a tube.

The differential diagnosis between early abortion and a ruptured tubal gestation sac is often impossible.

Treatment.—The palliative treatment consists in rest and the administration of opiates. An ice bag may be applied over the heart and the seat of pain. In the event of progressive weakness from internal hæmorrhage, a consultation should be called with a view to opening the abdomen to look for and ligate a bleeding vessel. Extrauterine pregnancy may go to full term and may require laparotomy. A calcified tumor containing a fœtus is called a *lithopædion.*

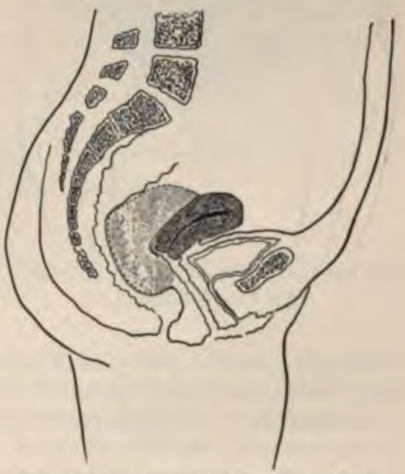

FIG. 165.—PELVIC HÆMATOMA (C. F. Adams, The Post Graduate).

PELVIC HÆMATOCELE

Pelvic hæmatocele may develop without extrauterine pregnancy, from the rupture of a blood vessel or angeioma of the annexa. The symptoms are those of *internal hæmorrhage.* In the event of a timely arrest of hæmorrhage a large blood clot in Douglas's pouch can be felt by bimanual palpation. This may give rise to pressure symptoms or may become infected and turn into a suppurating mass, in which event incision and drainage from below or total extirpation from above would be indicated.

PELVIC INFLAMMATION AND SUPPURATION IN THE FEMALE

Infection of the pelvic organs and tissues may take place in the course of parturition and abortion. It may readily be brought about by unclean surgical manipulations, viz., soundings, curettage, and cauterization. Many cases are of gonorrhœal origin, as first pointed out by Noeggerath. Latent or unsuspected gonorrhœa in the male is the cause of the vast majority of cases of pelvic suppuration in married women. Some few cases of pelvic suppuration are of tuberculous origin or are due to an extension of the inflammatory process from contiguous parts, and in a general way we may divide pelvic suppuration into that originating in the *annexa* and that of the *pelvic tissue*.

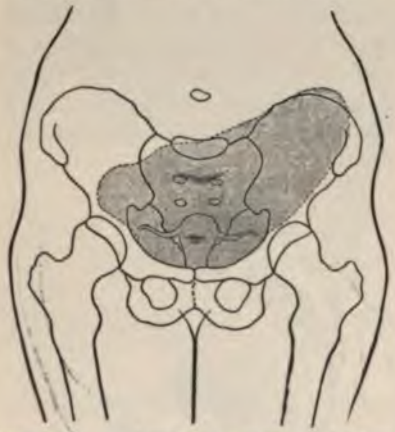

FIG. 166.—PELVIC ABSCESS (C. F. Adams, The Post Graduate).

Clinical Varieties.—The principal clinical varieties of pelvic inflammation and suppuration may be grouped as follows: Endometritis and metritis with cellulitis or pelvic peritonitis, pyosalpinx with and without cellulitis, pyosalpinx with ovarian cyst, pyosalpinx with parametritic abscess, ovarian inflammation, acute and chronic (cystic, fibroid, purulent); tuboovarian inflammation and abscess, stump and suture suppuration following an operation, appendicitis and pelvic suppuration, septic cystitis and pelvic suppuration, septic proctitis and pelvic suppuration, intestinal perforation and pelvic suppuration.

Diagnosis.—The diagnosis of pelvic suppuration is made from the history, the symptoms, and the physical signs, as elicited by bimanual palpation. Parturition, abortion, traumatism, and gonorrhœa are the all important ætiological factors. The general and local symptoms are *fever, chills, rapid pulse, pain, local discharge,* and pain, tumefaction, or fluctuation on bimanual palpation.

Fever may be absent, however, and pain as a symptom is of relative value only. Most patients complain of weakness and of a sense of pressure on the bladder and rectum. In pelvic peritonitis the onset is quite sudden, with pain and vomiting. Both legs are usually flexed, as the inflammation is generally bilateral in contradistinction to cellulitis, in which the onset is gradual, and the inflammation, tumefaction, and abscess are usually unilateral. Primary cellulitis is uncommon. If an indurated mass softens and presents a bulging, fluctuating mass, it is hardly necessary to resort to the aspirating needle for diagnostic purposes. When the pelvic organs are imbedded and fixed in a massive pelvic induration, it is impossible and unnecessary to make or attempt to make a refined diagnosis as to the parts involved. The importance of determining the leucocytosis has been overestimated in gynæcological as in other disease.

Prognosis.—*Pelvic inflammation with exudation* may subside without abscess formation, and in some rare cases small pus sacs may undergo spontaneous absorption in the pelvis as elsewhere, or a pus tube may discharge its contents into the uterine canal or the bladder. Pus may rupture into adjacent organs and give rise to a new attack of inflammation, or it may rupture into the abdominal cavity and give rise to general peritonitis.

Prophylaxis.—1. To prevent suppuration, examinations in patients suffering from any variety of pelvic inflammation should be made gently and infrequently. 2. The use of sounds and cervical dilators, under ordinary circumstances, should be restricted to the operating room, where the parts can be thoroughly prepared and the operator, nurse, and instruments thoroughly asepticized.

Treatment is palliative and operative. Rest in bed until the symptoms have disappeared is of prime importance. Hot vaginal douches are to be employed several times a day. A low enema may be given to cleanse the lower bowel, and rectal irrigations with hot water by means of a double current catheter are of great benefit to the sufferer. Rectal suppositories of ichthyol (gr. v) or opium and belladonna (āā, gr. ½) may be used twice a day. An ice bag or hot water bag may be placed over the lower part of the abdomen. Should a fluctuating abscess present, it may be incised and drained from the vagina or rectum. *Massage* in gynæcology is not looked upon with as much favor as formerly. The contraindications are acute inflammations, the presence of pus, and pregnancy.

BENIGN AND MALIGNANT NEW GROWTHS OF THE FEMALE PELVIS

Polypi

Uterine polypi may be mucous or fibroid in character. They present no characteristic symptoms and are found protruding from the cervix at a vaginal examination made for the purpose of establishing the cause of an existing leucorrhœa with hæmorrhage.

Treatment.—Pedunculated growths should be twisted or cut away; sessile polypi may be excised.

Cystic Tumors of the Ovaries and Broad Ligaments

The pathological classification of ovarian cysts is made after their removal from the body. Some are unilocular and others multilocular; some are intraperitoneal and others are extraperitoneal.

Symptoms and Diagnosis.—There are no pathognomonic signs pointing to their presence until they have reached a certain size sufficient to give rise to subjective and objective symptoms, such as enlargement of the abdomen, a sensation of weight and bearing down, some leucorrhœa, and circulatory, respiratory, and menstrual disturbances. Tumors are readily recognized by bimanual palpation. Pain may or may not be present. When the cyst is of sufficient size to interfere mechanically with the function of neighboring and displaced organs, the general health fails, the patient loses weight and strength, and the face assumes a characteristic pinched expression. Bimanual palpation reveals a normal sized uterus, frequently displaced, and a fluctuating swelling. In distinguishing between an ovarian cyst and free or sacculated ascites, mistakes may be made. Ascites and an ovarian cyst may coexist, in which case a puncture at different points would reveal two fluids of different character; when they coexist it points to malignancy of the growth. The diagnosis of large cysts offers more difficulties than that of small ones. A large ovarian cyst will displace the intestines; in cases of ascites the intestines float on top of the horizontal fluid.

Dermoid Cysts of the Ovary and Ligaments

These present nearly the same symptomatic and diagnostic features as the ordinary variety. When a dermoid cyst ruptures into the urinary bladder, the escaping solid contents, such as hairs and endothelial masses, may form the nuclei of urinary calculi. When small calculi are passed, to which hairs are attached, a dermoid cyst should at once be suspected.

Treatment.—Pelvic cysts require removal by abdominal section. The mortality from this operation is quite low in the hands of aseptic and experienced operators.

Ovarian Fibromata

Fibromata are the more common *benign solid tumors* of the ovary. Other forms are comparatively rare. They present the same diagnostic features as cysts, but they do not fluctuate and their operative removal is indicated when the symptoms warrant it.

Uterine Fibroid Tumors

Uterine myomata may be submucous, interstitial, or subperitoneal. Subperitoneal tumors are frequently adherent to the omentum and intestines. Myomata may undergo hyaline and malignant degeneration. Fibroids and cancer may coexist, but this combination is quite rare. They may undergo cystic degeneration. Fibroids may undermine health and shorten life by hæmorrhage or by mechanical interference with the function of neighboring organs, and they may become gangrenous, but they rarely undergo transformation into malignant growths. Fibroids, generally speaking, are benign but not harmless, and are a common disease in women, especially in the unmarried and nulliparous. As a rule they are of slow growth, and frequently cease to grow after the menopause. They increase in size during menstruation and pregnancy; after parturition a tumor that was plainly evident almost completely disappears.

Symptoms.—Hæmorrhage, although not invariably present, is the most conspicuous symptom in fibroids of the uterus (menorrhagia or metrorrhagia). Pressure symptoms, such as pain, vesical irritation, rectal irritation, and leucorrhœa, are usually complained of. Subserous fibroids may exist without giving rise to marked symptoms. Submucous fibroids, when expelled by uterine contractions, cause considerable pain and hæmorrhage. When fibroids spring from the posterior part of the cervix, they may offer an obstruction during parturition, but Nature's efforts are generally successful in elevating the tumor out of the pelvis.

The **diagnosis** is made by taking into consideration the symptoms as described and by means of a physical examination (bimanual palpation).

Differential Points.—Soft, œdematous tumors may simulate pregnancy, ovarian cysts, or inflammatory exudates. Carefully mapping out the body of the uterus and noting the nodular masses in intimate and close connection therewith will lead the experienced examiner to a correct interpretation of the abnormal condition. Sounding the uterine cavity is permissible only when pregnancy is not in question and is usually unnecessary and often dangerous.

Treatment.—Submucous fibroids may become polypoid and protrude from the uterine cavity. Their pedicle may be constricted and crushed or cut through, after which the vagina and uterine cavity should be firmly tamponed to prevent hæmorrhage. Interstitial and subserous fibroids in women near the menopause may be left to themselves if the symptoms are not urgent. Rest during the menstrual period is essential, and women so afflicted should wear an abdominal supporter. Pain may be controlled by the use of opium and belladonna suppositories and the hot water bag. Fluid extract of ergot and gossypium, 15 drops of each, given twice a day, will control hæmorrhage in most cases. When palliative measures fail to bring about a reasonable degree of personal comfort, extirpation of the tumor or of the uterus plus the tumor is indicated in preference to oophorectomy, which was formerly done with a view to establishing an artificial menopause. The principal indication for radical operative interference is excessive hæmorrhage.

MALIGNANT NEW GROWTHS; SARCOMATA AND CARCINOMATA

Cancer of the Cervix Uteri

This occurs most frequently after the menopause, the classical symptoms being *hæmorrhage*, *pain*, and a *discharge*.

The differential diagnosis between cancer, syphilis, and tuberculosis of the cervix and endometrium involves an expert examination of the scrapings under the microscope and the employment of the therapeutic test for syphilis (potassium iodide), which should never be omitted. In cancer the tissues bleed at the slightest touch.

The **prognosis** is unfavorable; patients afflicted with cancer of the cervix do not usually live more than three years.

Treatment.—Complete and radical hysterectomy may prolong life. When the disease has extended to the cellular tissue or involves the bladder, rectum, or vagina, radical treatment need not be attempted.

Palliative treatment consists in relieving pain, hæmorrhage, and foul discharges. This can be accomplished more or less effectively by means of the actual cautery under anæsthesia, by the use of suppositories of opium and belladonna, by administering morphine subcutaneously, and by frequent douching with Labarraque's solution, 1 to 20, or other deodorizing and cleansing irrigations.

Cancer of the Body of the Uterus

This occurs only in a small percentage of cases of uterine cancer. The symptoms are practically identical with those of fibroids, but the cachexia, even in the absence of profuse hæmorrhage, is marked. Bimanual palpation reveals an enlarged uterus and a patulous cervix. Early and complete hysterectomy offers a more favorable prognosis than in cancer of the cervix.

Malignant Tumors of the Ovary

Malignant tumors of the ovary present the same symptoms and diagnostic features as benign new growths in this region, but cachexia is more pronounced at an early stage and ascites is generally present. Their early operative removal is the only hope of prolonging life.

Deciduoma malignum is a rare form of malignant degeneration of intrauterine tissue taking its origin in remnants of chorionic villi or remnants of placental tissue retained in the uterus after labor or miscarriage.

ABORTION; MISCARRIAGE

The expulsion of the fœtus in the first months of pregnancy from divers causes, such as syphilis, traumatism, pelvic tumors, acute infectious disease, etc.

Symptoms.—Hæmorrhage and pain are the principal symptoms. According to the duration of pregnancy these symptoms will vary in intensity. When abortion occurs after the sixth month, we speak of premature labor.

Prognosis.—In inevitable abortion the fœtus is destroyed. The dangers to the mother are sepsis and bleeding. The remote dangers are subinvolution of the uterus, endometritis, and sterility.

Treatment.—The prophylactic management includes the correction of any known cause. If the patient has aborted a number of times, rest and the avoidance of sexual intercourse and of bicycle riding should be insisted upon. Antisyphilitic measures are indicated in that class of cases throughout the natural term of pregnancy. In *threatened abortion* the patient should rest in bed, and opium and belladonna in the form of rectal suppositories should be administered, or morphine given hypodermically. In *unavoidable abortion* the cervix is patulous, and a light tamponade of the uterine cavity with iodoform gauze is readily accomplished by means of a hollow tampon carrier. Uterine contractions will expel the contents of the womb. In case of severe hæmorrhage tamponade of the vagina may be added to the uterine tamponade. In unavoidable abortion ergot may be given before and after the expulsion of the ovum. Retained placental tissue requires removal by means of curettage. In cases of labor and abortion antiseptic precautions should be taken as follows: For use on the vulva, the mixture consists of one drachm of chloride of calcium and two drachms of the U. S. P. (36 per cent) preparation of acetic acid to the quart of lukewarm water. For hand disinfection a solution of double this strength is employed, following the usual cleansing with soap and water. After the hands have been immersed in the solution for five minutes, they should be rinsed in plain water or a dilute lysol solution, as the chlorine which is set free will readily corrode instruments.

PUERPERAL SEPSIS

Puerperal infection is wound infection; therefore, it is the duty of the obstetrician to practise *antiseptic midwifery* and prevent puerperal fever. As soon as there is a rise of temperature after delivery, the cause of the fever should be determined if possible. Constipation, malaria, typhoid fever, mammary inflammation, and venous phlebitis external to the genital tract are to be excluded before we can suspect or establish the diagnosis of *puerperal sepsis*.

Puerperal infection may be a *local infection* of the *external genitals of minor importance*, or it may be a serious affection of the internal genitals (uterus), or the whole system may be drawn into the morbid process. Resistance to puerperal infection, as in any other infection, lies in the lymphatics and in the circulating blood, and a favorable or unfavorable termination of the resulting systemic poisoning (septicæmia, toxæmia, bacteriæmia) depends upon the nature, quantity, and persistence of the septic material furnished by the morbid process and upon the natural resistance of the soil and circulating media reenforced by well directed therapeutic measures, which will do no harm. The great difficulty as regards the local management of puerperal sepsis is the difficulty of locating the lesion or the portal of entrance.

Treatment of Puerperal Fever.—As soon as a fœtid discharge is detected, the vagina should be cleansed thoroughly with corrosive sublimate, 1 to 2,000, followed at once by boiled water irrigations. Such irrigations are effective when we have to deal with local lesions in the vagina and at the entrance to the genital tract. If we know that decomposing placental remnants are within the uterus, they should be removed by means of the finger. Intrauterine douches are not as a rule indicated, except before and after intrauterine manipulations. A patulous cervix a day or two after confinement indicates that the uterus is *not empty*. In such cases the cervix is so patulous as to admit one or two fingers readily. If it is known that the placenta has passed completely, the *suspected* retention of membranes alone does not as a rule call for active interference. In the mean time the patient has probably taken 10 grains each of quinine, calomel, and jalap, and in the event of the temperature not falling to normal, constipation and malarial fever may be ruled out. The agglutination tests for typhoid and paratyphoid fever are now to be employed and an examination of the urine (collected by catheter) should be made, having pyuria in mind, and an examination of the throat and vulva for diphtheritic deposits. If the patient has the slightest sore throat or shows a pseudomembranous deposit at the vulva, or has in any way been exposed to diphtheritic infection, 2,000 units of diphtheria antitoxine should be given subcutaneously at once. Acute miliary tuberculosis must also be thought of in puerperal cases. When by exclusion the diagnosis of puerperal sepsis is established, the question of intrauterine treatment will present itself.

Irrigation and drainage of the uterine cavity should be done in the following manner: A solution of lysol (from 1 to 3 per cent) is used for flushing the uterus. The fluid is introduced by means of the uterine catheter. Dilatation is unnecessary, as the os is patulous on the second or third day following labor in all cases in which placental remnants are retained. In this class of cases careful scraping with a blunt curette may be indicated and will do no harm. Owing to the difficulty of locating the source of infection, severe surgical measures, such as the removal of the entire uterus, are rarely indicated and should not be attempted without a consultation.

The various *sequelæ of septic infection*, such as bedsores, pneumonia, pleurisy, phlebitis, arthritis, etc., will require the attention and treatment which such complications call for.

CHAPTER XX

OSSEOUS, MUSCULAR AND ARTICULAR SYSTEM, AND ORTHOPÆDIC MEMORANDA

DISEASES OF BONE

Synopsis: General Remarks.—Remarks on the Pathology of Inflammation in Bone.—*Acute Inflammation of Bone.*—Osteoperiostitis, Osteomyelitis, Osteoepiphysitis, Pyæmic Bone Abscess.—*Chronic Inflammation of Bone.*—Tuberculous Osteoperiostitis, Tuberculous Osteomyelitis, Bone Syphilis, Actinomycosis of Bone, Tumors of Bone, Hypertrophy of Bone, Atrophy of Bone, Osteitis Deformans, Leontiasis Ossea, Osteomalacia.

GENERAL REMARKS

Aside from injuries and congenital or acquired anomalies of form and of tumor formation, we observe in bone, muscles and joints a variety of diseases due to *simple* or *neuropathic malnutrition* and to *acute* and *chronic infection*.

Infection usually takes place through the circulation. We may have a *rheumatic, gonorrhœal, syphilitic, tuberculous*, or *malarial infection* of these tissues, or other toxic diseases, such as influenza, typhoid fever, scarlatina, measles, variola, diphtheria, etc., may be underlying factors. The streptococcus, but particularly the staphylococcus invasion through *the skin or mucosa*, is frequently the cause of osteomyelitis and other inflammatory conditions. The primary lesion may be a pustule, an eczematous patch, a stomatitis, etc. *Acute inflammations* may subside or terminate in serous or purulent effusion and necrosis. *Chronic inflammations*, simple, syphilitic, tuberculous, actinomycotic, etc., are usually accompanied by plastic deposits.

As the bones and muscles govern locomotion, the subject of *posture* and *gait* demands a few words. A patient in bed may be in the dorsal position and immobile on account of pain. The legs may be drawn up, he may favor one side, or he may exhibit restlessness or show a position peculiar to paralysis and atrophy. The gait may be ataxic, spastic, waddling, or halting. The movements may be incoordinate and trembling. In the prone position, when the body rests upon the head and heels, the trunk being arched, we speak of *opisthotonus*. In dyspnœa and orthopnœa the patient sits upright with the hands and elbows placed in such a way as to support the head and thorax, in order to facilitate breathing.

Remarks on the Pathology of Inflammation in Bone

According to the location of the point of least resistance, the pathological process may begin in the medulla, the bone proper, or the periosteum. As these are intimately associated, we seldom observe a pure osteitis, periostitis, or myelitis, but usually an inflammation including two of the contiguous parts.

If the inflammatory process begins in the periosteum we notice swelling, increase of vascularity, and a tendency of the periosteum to separate from the bone. This inflammation may recede and the part involved resume its normal condition, or the process may go on to suppuration and the pus burrow under the periosteum for a greater or less distance. Healing may begin as soon as this abscess is evacuated, which may result spontaneously through the soft parts, or be hastened by surgical means. Usually, if the process goes on to suppuration, the portion of bone denuded becomes necrotic, and healing is delayed until this piece of bone separates and is exfoliated or surgically removed.

Should the process begin in the bone proper, there is first increased vascularity within and around the focus of disease, with the formation of capillary loops. Absorption and erosion take place along the walls of the Haversian canals, a *rarefying osteitis*. At the same time new bone begins to form underneath the periosteum, as well as in the medulla, causing an enlargement of the bone at that point. Under favorable conditions the inflammatory exudate is absorbed. If, however, the irritation is of long duration, the bone remains larger and harder than before (*osteosclerosis*). This new bone may become as hard as ivory. Should the inflammatory process so press upon the vessels as to obliterate them, necrosis of a greater or smaller area takes place. If the process goes on to suppuration, particularly around the dead piece of bone, we have resulting a *chronic abscess*, a condition particularly seen in tuberculosis of the bone. In a very acute and particularly virulent inflammation, with compression of the vessels, there may be an acute necrosis with abscess formation which does not heal until the inflammatory products and necrosed bone are evacuated spontaneously or by surgical procedure.

In *osteomyelitis* the inflammation begins in the medulla from an infection carried to this point of least resistance by the circulation. In acute forms a serious and widespread destruction with often fatal results may occur. The process may remain local or involve the whole shaft of a long bone between the epiphyseal margins. The process probably seldom resolves before producing sufficient pressure in the hard and resistant tissue to cause necrosis. *Embolic* processes in various organs may occur.

With the formation of an abscess within the medullary cavity, if no surgical treatment intervenes, and the patient survives, new bone is formed beneath the periosteum, which encloses the old bone tissue like a shell. The process now becomes chronic; the old bone necroses, the pus burrows and finally escapes through cloacæ in the new bone, breaking through the periosteum to form an abscess in the soft parts. This in turn presses farther, burrowing and undermining until it reaches the surface, where its contents are discharged. The old necrosed bone is partly absorbed, and may be broken up into smaller sequestra to be discharged through the cloacæ. Healing cannot take place until all the dead bone has been exfoliated, and if Nature unassisted manages the case, the process may last for years with alternating opening and closing of the sinuses.

In *subperiosteal hæmorrhage* the extravasated blood, if it is not infected, is slowly absorbed without apparent harm to bone or to periosteum. If it becomes infected, subperiosteal abscess follows.

Examination of bony structures in particular is facilitated by means of the Röntgen rays (fluoroscope and shadowgraph).

The general principles of *treatment* in this group of ailments consist mainly in the application of *rest, elevation, traction, extension, immobilization,* and *elastic compression* together with hydrotherapy, massage, vibratory massage and stimulation, movement cure, the application of dry hot air, and specific and symptomatic medication. The details of surgical treatment will be found in the books on surgery.

ACUTE BONE INFLAMMATION

Osteoperiostitis

Simple Osteoperiostitis.—SYMPTOMS.—In a simple case, from injury and a mild infection, there are pain and swelling, with or without slight redness and heat. There is slight or no elevation of temperature, and little or no systemic disturbance.

TREATMENT.—Antisyphilitic remedies are indicated in suspected cases, and for the others the recumbent position, an ice bag, or wet dressings. A *subperiosteal hæmorrhage* is best absorbed with the assistance of heat, pressure, massage, and vibration.

Purulent Osteoperiostitis.—If the process continues in spite of this treatment, or the infection is more severe, virulent, or diffuse, or the hæmatoma becomes infected, we observe the systemic signs of pus—fever, with or without chills, with more or less severe localized pain, redness, tenderness, and later fluctuation.

The TREATMENT is surgical. In the severe cases with urgent general symptoms an early exploratory puncture or incision is indicated.

Acute Infectious Osteomyelitis

Symptoms.—There is a chill, or rigor, followed by high fever. The local symptoms may be accompanied by a developing severe septic intoxication, stupor, and delirium. *Pain,* gnawing or boring, is an early and persistent symptom. It may not be distinctly felt at one point, but may extend through the whole shaft of a bone and even into the neighboring joints. It is worse at night, increasing with the accumulation of the exudate and diminishing with perforation. In multiple osteomyelitis pain may not be a prominent symptom. *Tenderness* on pressure is severe. *Swelling and redness* are not marked until the periosteum becomes involved. Œdema from thrombophlebitis and enlargement of superficial veins may be present. When perforation takes place and pus accumulates in the soft parts, we observe prominent redness, swelling, and fluctuation. The limb and neighboring joints cannot be moved without causing pain. *Spontaneous fracture,* separation of the *epiphyses,* or a *synovitis* of the adjacent joints may occur earlier or later in the disease.

The **diagnosis** is to be made by the deep, boring, gnawing character of the pain and by its not being most intense in the joint, although frequently very near it, at the epiphysis. *It is sometimes mistaken for sciatica or for rheumatism, particularly in young children.*

The **treatment** is surgical.

Acute Epiphysitis

This occurs in infants and young children as a result of pyogenic bacterial infection. It resembles osteomyelitis in symptoms, except that it has a tendency to involve the adjacent joint rather than the shaft of the bone, giving rise to a suppurative arthritis. In young infants it may take its origin from an infection of the umbilical cord; in older children from an acute amygdalitis, diphtheria, scarlet fever, scurvy, or other infectious disease.

Symptoms.—The tissues over an epiphysis become swollen and painful and the limb is not moved. The child is feverish and restless, showing a systemic infection. The joint soon presents the appearance of an acute suppurative arthritis, or an abscess may point near a joint. If an abscess points toward and penetrates a joint, rapid absorption of the cartilage occurs and the pus reaches the surface. Healing takes place often with very little impairment of the joint function, but with subsequent retarded growth.

Treatment.—The prophylactic management of *scurvy* and other infections predisposing to acute epiphysitis is of prime importance. Rest and elevation of the affected part are indicated. After the formation of pus the treatment is surgical.

Pyæmic Abscess of Bone

If there is a localized process instead of an osteomyelitis, due to an infectious embolus, there results a suppurative osteoperiostitis with abscess formation. The treatment is described under that head.

CHRONIC INFLAMMATION OF BONE

Tuberculosis of Bone

Primary general tuberculosis of bone is very rare and exists only as an accompaniment of general tuberculosis.

Localized tuberculosis is usually seen in the cancellous tissues of the carpus, the phalanges, the bodies of the vertebræ, and the ends of long bones. In this latter position the joint is frequently involved. The pathological process is very similar to that of other forms of bone inflammation, except that it is more chronic and shows the characteristic caseation and softening. We observe, therefore, *tuberculous osteoperiostitis*, *tuberculous osteomyelitis*, and *tuberculous bone abscess*.

Tuberculous osteoperiostitis is very common and may be seen in almost every bone of the body. Extensive destruction may occur, and the process go on to abscess formation.

SYMPTOMS.—Pain and tenderness are not marked, and usually the first symptom to attract the attention of the patient is swelling. Frequently before this develops there are signs of systemic disease or other tuberculous symptoms.

TREATMENT.—General antituberculous and tonic treatment should be pushed, and the local trouble treated by rest, by artificial hyperæmia (Bier's treatment), or by surgical interference. (See Joint Tuberculosis.)

Tuberculous Osteomyelitis.—This may affect the long, short, or flat bones. It is more often seen in young adults, and the epiphyseal margins are usually the starting points. An hereditary predisposition to tuberculosis is generally recognized as being present in many cases. Impaired nutrition following some systemic infection, such as scarlet fever, measles, enteritis, typhoid fever, or pneumonia, predisposes to tuberculous disease.

At the places of infection we see first a rarefying osteitis, then the periosteum thickens and granulation tissue forms. A sequestrum may form. The granulation tissue may become caseous, or it may liquefy and produce the so called tuberculous abscess consisting of degenerated cells, curdy, cheesy material, and bony detritus. It looks like pus, but is not unless it has become infected by pyogenic organisms from without or through the blood. It opens into a joint or on to the surface, leaving a sinus lined by tuberculous granulations. At the bottom of this sinus, by means of a probe, we can usually detect denuded, necrosed, or soft bone. The sinus may continue discharging for months or years if not treated, or an absorption or calcification with the formation of sclerosed bone may take place.

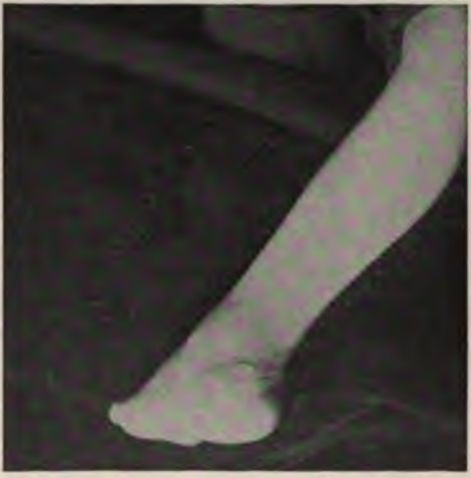

FIG. 167.—TUBERCULOSIS OF OS CALCIS.

SYMPTOMS.—Spontaneous moderate pain or tenderness is the most important symptom, but at first the disease is very difficult to recognize. The progress is very slow, and we seldom make a diagnosis until localized pain or an external swelling develops. Impairment of function and atrophy of the muscles from disuse are present. Œdema and finally fluctuation occur over the swelling, and sometimes redness, but the latter is usually absent and we observe the characteristic *white swelling*. Fever is often very slight and sometimes absent unless there is a mixed infection. When the abscess breaks or is incised, we see the tuberculous contents.

DIAGNOSIS.—It is only in cases of chronic osteomyelitis from other causes that we are likely to be mistaken in diagnosis. If we remember that tuberculous osteomyelitis is found most often in young adults, is slow in progress, apt to involve the articular ends of long bones, and to form a limited area of swelling with but moderate tenderness on pressure, we usually make no mistake.

The PROGNOSIS, with the best of surroundings, as well as with the best of treatment, general and local, is moderately good.

TREATMENT.—Hygienic and tonic management and surgical treatment.

Syphilis of Bone

Syphilitic Periostitis.—In the early stages of syphilis we may observe the small periosteal nodes, most usual on the superficial aspect of the tibia, clavicles, sternum, ribs, and skull. They are very painful, particularly at night, as are all syphilitic bone affections. They are also tender to the touch. Amelioration is obtained by instituting antisyphilitic treatment. In hereditary syphilis, or in the later stages of acquired syphilis, frequently enough periostitis of one of the long bones occurs, the anterior margin of the tibia being a favorite location. It is generally accompanied by a chronic osteitis, and may result in a syphilitic osteosclerosis or gumma.

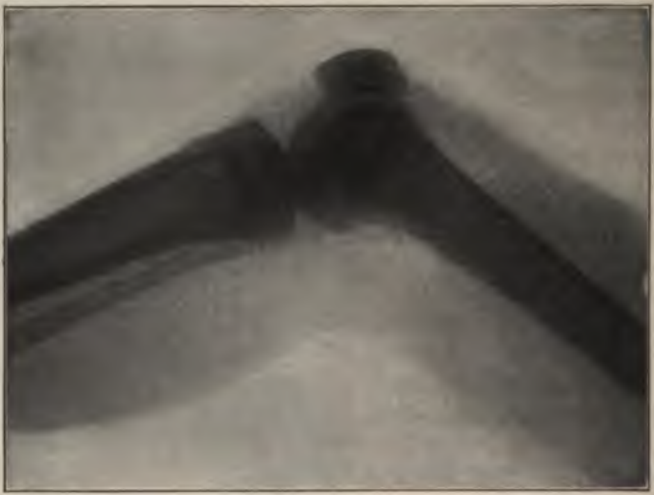

FIG. 168.—TUBERCULOUS FOCUS IN TIBIA, HEALED. Skiagram (Besser).

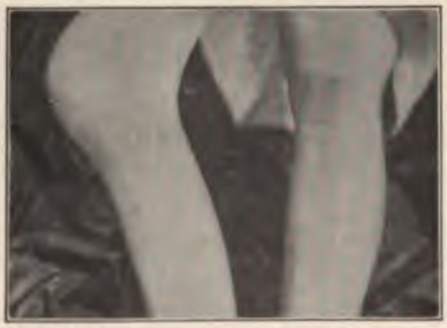

FIG. 169.—TUBERCULOUS KNEE DISEASE.

Syphilitic Osteitis.—Without the accompanying periostitis, we may observe an osteosclerosis of many bones at the same time. It produces more or less symmetrical enlargement of the bone involved.

Syphilitic gummata may form under the periosteum and at the same time may be associated with periosteal nodes and osteosclerosis. There may be a proliferation of granulation tissue, shutting off the circulation completely, causing syphilitic necrosis resembling an ulcerative process in the soft parts, and we then term it *syphilitic caries of bone.* This is most often seen on the sternum or skull. The distinctive feature of a gumma of bone is an area of fluctuation in the tumor, which, untreated, may break down and discharge a thin watery fluid. It is prone to secondary infection, which makes an ugly, deep, and intractable ulcer. It is likely to undermine the surrounding tissues.

Hereditary syphilis of bone does not differ much from the acquired form. The lesions are more likely to be multiple and affect the long bones. As a rule it is less painful and less amenable to treatment.

Syphilitic dactylitis is both hereditary and acquired, in the shape of an osteoperiostitis of the phalanges of the fingers with an involvement of connective tissue and symmetrical enlargement.

TREATMENT.—The treatment of syphilis of bone is systemic ("mixed treatment"). Sometimes advanced obstinate cases with severe pain demand surgical help. Care should be observed not to create a mixed infection of an open lesion, as it thus becomes more difficult to handle.

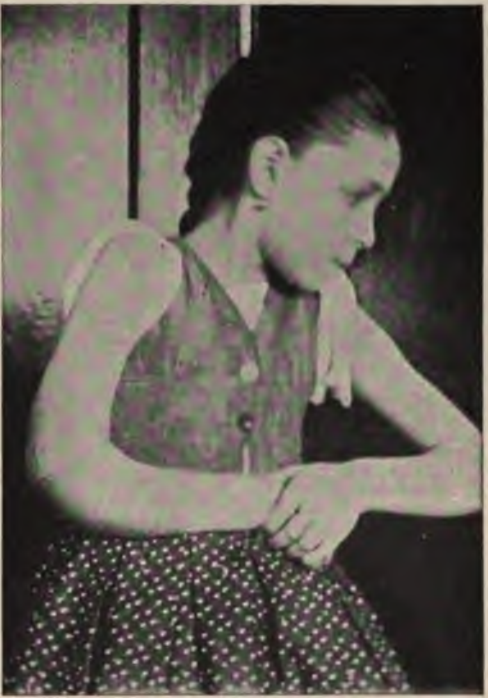
FIG. 170.—TUBERCULOUS DISEASE OF ELBOW.

Actinomycosis of Bone

This rather rare infection of bone is usually seen in the maxillæ, where it apparently gains access through carious teeth. Marked swelling and a little pain are the usual symptoms. Abscesses may form, containing the little hard, white characteristic nodules. Under the microscope we recognize the ray fungus.

The **treatment** is systemic (potassium iodide) and surgical.

Benign Tumors of Bone

Tumors of bone take their names as a rule from the tissue from which they spring.

Cysts.—Non-malignant cysts are very rare. Those of the teeth are described as *odontomas*. Those of the long bones cause enlargement and a thinning of the overlying bony tissue. Exploratory puncture or a shadowgraph establishes the diagnosis, and the treatment is surgical.

Osteomata are tumors composed of bony tissue. If they grow from the surface of a bone, they are called *exostoses*. Their structure is the same as that of the bone from which they spring, with a regular arrangement of the cells. Cartilaginous growths from the epiphyseal ends of long bones, or from tendons at their attachments, subungual growths, and inflammatory growths may become bony in character and are called *exostoses*, but they are not true bony growths.

Compact osteomata, structurally, are the same as normal compact bone, and although they may grow from any bone, they are most often found in the frontal sinus, the external and internal auditory meatus, and the mastoid.

Cancellous osteomata resemble cancellous bone and may be sessile or pedunculated.

Although osteomata may originate in any bone, they are found most often connected with the phalanges, femur, tibia, humerus, vertebræ, and flat bones.

Bony tumors occur rarely as independent neoplasms in the breast, testicle, or brain—as *ossifications*, however, not true bone tumors.

Odontomata, or teeth tumors, are named from the part of the tooth from which they arise.

Epithelial odontomas are encapsulated tumors, more often in the mandible, and are made up of a congeries of variously shaped cysts.

Follicular odontomas are dentigerous cysts, usually associated with the permanent molars. They may become very large and produce great deformity. The cyst wall is calcareous, occasionally bony, and it usually encloses a viscid fluid and a tooth that has not emerged, which may be fixed or loose and inverted.

Fibrous Odontomas.—The capsule surrounding a tooth before its eruption may become thickened, preventing eruption of the tooth, and form a new growth.

Compound follicular odontomas are larger and contain more than one tooth, fragments or denticles.

Radicular odontomas are very rare. They are due to abnormal growth of the roots of the teeth, which push the crown before them. The enamel is not involved.

Composite odontomas are new bony growths composed of a disordered conglomeration of all the tissues of the teeth.

Fibromata of bone usually develop from the periosteum, and are most often found attached to the jaws, the palate, or the base of the skull.

Chondromata are really cartilaginous in nature, but may grow from normal bone, as well as from normal cartilage. True chondromata may arise also from the medullary cavity. If they originate in other tissues, they often show malignancy.

Treatment of Benign Tumors of the Bone.—If any is required, it is surgical.

Bone rickets is discussed in the section on Pædiatrics.

Malignant Tumors of Bone

Sarcomata.—A primary malignant tumor of bone is always one of the varieties of sarcoma. Its structure is the same as it is when originating from other tissues. In bone it may be central or peripheral in origin. The malignancy of bone sarcoma is proved by its tendency to recur after removal, and to metastasis, especially in the lungs.

The degree of malignancy differs greatly according to the situation of the growth and the nature of the cell. Giant cells predominate in the least malignant, the myeloid, and the periosteal spindle celled sarcoma is the most malignant.

Their favorite locations are the jaws and the articular extremities of the long bones. The lower end of the femur and the upper end of the tibia are the most frequently involved, probably because this region is most exposed to injury, which seems a predisposing factor to their development. The young adult is most often affected, although no age is exempt. Their growth is very rapid, particularly in periosteal tumors. Pulsation is of frequent occurrence in the central tumors of the long bones. Spontaneous fracture of the bone at the seat of growth may occur. Pain is a prominent symptom. The size may be enormous, but it is no criterion as to the probability of infection of other parts of the body.

The DIAGNOSIS is made by the history of the rate of growth, sarcoma growing very rapidly, from the fact that in sarcoma there is a difference in consistence in different parts of the tumor, and from the presence of pain. It is sometimes difficult to distinguish between a pulsating sarcoma and an aneurysm. We are aided in recognizing a sarcoma by its location, by the presence of bony plates on the surface, by its ill defined outlines and comparatively feeble impulse, and by the absence of any change in the arteries below the tumor. The radiograph is of very great value.

The TREATMENT is surgical. An operation should be early and radical.

Carcinomata, as primary growths, are probably unknown. They are not uncommon as metastases or as complications by extension.

Hypertrophy of bone is rarely seen unassociated with osteosclerosis. Occasionally, however, a congenital enlargement of a whole limb has been seen. Osteosclerosis and osteomyelitis are generally the cause of enlargement of bones. The term *osteoporosis* has been applied to this condition.

Atrophy of bone is more frequently seen, and usually results from defective nutrition and diminished function. The bone becomes more porous and the medullary cavity and cancellous tissue increase in size and are filled with fat. The cortex wastes. It is seen at any age, but most often in old people. In infantile paralysis, when the bones of one or more limbs remain wasted, we see this atrophy. We also see it after fractures, when function has been suspended for some time.

TREATMENT.—Various means to improve nutrition, passive motion, massage, and Esmarch's bandage, applied at intervals to produce hyperæmia, may be tried. In old age little can be done (see Bier's method, under Tuberculous Joints).

Osteitis deformans is a somewhat rare disease, characterized by a change in the size, shape, and direction of the diseased bones. It begins in middle life or later. The bones enlarge, soften, and gradually become curved, presenting considerable deformity. The long bones of the lower extremity or those of the skull are usually involved first.

The SYMPTOMS are not marked. There is some indefinite pain of the lower part of the spine and the lower limbs, which is generally attributed to rheumatism. The general health is usually unaffected.

TREATMENT seems of no benefit.

Leontiasis ossea is a rare bone disease characterized by a gradual enlargement, a hyperostosis, of the facial and cranial bones, leading to great deformity and causing pain by pressure.

The TREATMENT is surgical, simply to relieve pain.

Injuries, Fractures, and Dislocations of Bones.—All bones are subject to injuries, direct or indirect, which may result in fracture or dislocation. These lesions are described in books on surgery.

Osteomalacia (*Mollities Ossium*)

Osteomalacia is a disease in which there is pain in the bones, with their gradual softening, subsequent bending, and liability to spontaneous fracture.

Ætiology.—The cause of the disease is unknown. It is a disease of adults, being exceedingly rare in children, usually occurring between the ages of twenty-five and forty and of far greater frequency in women than in men. It is more frequent in certain sections of country than in others, the regions where it is oftenest seen being along the Rhine, in Westphalia, in eastern Flanders, and in northern Italy. Osteomalacia appears to have some relation to ovarian secretion.

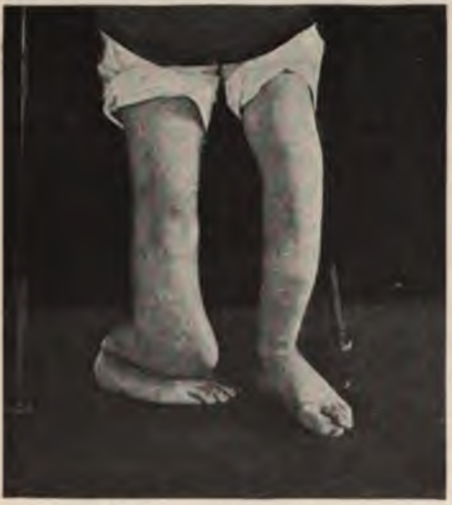

FIG. 171.—OSTEOMALACIA DEFORMITY.

Childbearing is certainly an exciting cause in many cases, as the first signs and exacerbations date from and appear during pregnancy.

Symptoms.—The first symptom usually noticed is a deep seated pain in the sacral region, in the back of the thighs, or in the neck. It is usually called rheumatic. The next change is weakness in the lower extremities, so pronounced that the patient walks peculiarly and desires help. The pains continue and may be very severe. The deformities soon present themselves, or a fracture occurs. A difficult labor may be the first symptom calling attention to the bony condition.

When the disease has advanced, the deformities may be very marked, affecting the whole skeleton. The spine, increasing the normal curves, assumes a marked kyphosis, or the curves may be in the opposite direction. The head approaches the sternum more and more, making the patient appear shorter than he is in reality. The ribs are pressed in laterally and protruded at the sternum, which is pushed forward and often fractured at several places.

The shape of the pelvis, not very apparent without careful examination, may become so changed as absolutely to prevent parturition. The sacrum is carried down by the weight from above and the ilia and ischia are pressed inward by the heads of the femur, which also press upward in the acetabula and cause the pubic symphysis to be thrust forward like a beak. This deformity makes the peculiar gait uncertain, tottering, and characterized by short, painful steps, the lower limb and pelvis being jerked forward as if in one piece. The arms, legs, and thighs are bent or fractured in various ways, but the patient has usually become bedridden before she is much deformed. The *bones of the head* are seldom affected. The *teeth* may become loosened. The *viscera* usually perform their functions, although the bony deformities may press upon them. The lungs may be compressed, and dyspnœa, feeble breathing, and pneumonia be the result. The *urine* sometimes contains albumin. It is said by some writers to contain an excess of calcium salts.

Course.—The course of the disease is chronic. In some the different stages follow rapidly, and the patient is soon obliged to go to bed and remain there. It may then run its course in a year. In others progress is noticeable only in the pelvis and then only during pregnancies, the disease remaining stationary or making only very slight progress at other times. Some live for many years with very slow advances of the disease, and are not obliged to remain in bed.

The **prognosis** is bad, as recovery is exceptional. The patients die from the general debility, or more often from the effects of the pressure on the lungs, or from *pneumonia*.

The **diagnosis** is not difficult in well developed cases. The locality, the examination of the pelvis, the peculiar hobbling gait, and its association with pregnancy are the salient points of distinction. Rickets is a children's disease with enlargement of the epiphyses. Children are very rarely affected with *osteomalacia* and the epiphyses are not enlarged. It is said that diffuse carcinosis of the bones may produce similar symptoms and deformities.

Treatment.—In the severe cases therapeutics seems of no avail. In the beginning there may be marked improvement by *hygienic* methods, good air, proper food, and tonics. *Warm baths*, with or without *salt*, are appropriate. Iron and phosphorus appear indicated.

At the meeting of the Surgical Congress in Berlin in 1902, three cases of non-puerperal osteomalacia were reported cured by castration.

CHAPTER XXI

OSSEOUS, MUSCULAR, AND ARTICULAR SYSTEM—*Continued*

DISEASES OF JOINTS AND BURSÆ

SYNOPSIS: General Remarks.—Sprains.—Synovitis, Acute, Purulent, Chronic.—Arthritis, Acute, Septic, and Gonorrhœal.—Acute Articular Rheumatism in adults and children. —Arthritis Deformans, Differential Diagnosis between Arthritis Deformans and Chronic Rheumatism.—Tuberculosis of the Joints.—Loose Bodies in the Joints.—Displacement of the Semilunar Cartilages.—Neoplasms of Joints.—Neuroses of Joints.—Neuralgic Conditions.—Neuropathic Arthritis.—Bursitis.

GENERAL REMARKS

JOINTS in all parts of the body, but principally those most exposed, are liable to *injuries*, such as *wounds*, *contusions*, *sprains*, *dislocations*, and *fractures*. Any injury, however slight, may be serious in its results, owing to a disturbance of the exquisite mechanism of a joint. There may be laceration of ligaments and synovial membrane, detachment of cartilages, or injury to the articular ends of the bones. The joints may be distended with blood. A slight bruise may result in rapid and complete recovery in a healthy subject, while in one who is in poor general health, or one suffering from tuberculosis, the injury may be the exciting cause of the development of a tuberculous joint, abscess, necrosis of the ends of the bone, or even sarcoma. In elderly people even the slightest injury may result in a serious arthritis and ankylosis.

Dislocation of joints may be of *traumatic origin* or may be *spontaneous or habitual*. Reposition of a recent dislocation is accomplished with and without general anæsthesia.

Wounds of joints, especially penetrating wounds, frequently carry infectious material into the joint, causing acute suppurative arthritis, a very grave affection which rarely heals without ankylosis and not infrequently results in the loss of limb and sometimes of life.

Fractures into a joint frequently heal with impairment of function.

SYMPTOMS of joint injuries in general are pain, tenderness, swelling, and more or less disturbance of function. The pain may not be severe, but upon trying to use the joint, it may be intense. There may be an effusion into the joint.

TREATMENT.—Owing to the disastrous results which may follow even a slight injury to a joint, it should receive the most careful attention. We should omit no means of diagnosis, such as the Röntgen rays and general anæsthesia, to exclude fractures and lacerations. If no complications are found, we should put the joint at rest by means of splints, sandbags, or posture in bed. Pressure, ice, or heat may ease the pain. After diminution of swelling and absorption of effusion, that is, several weeks after the injury, massage, vibration, and passive motion should be employed. Contusions may impair the function for months.

Wounds of joints with *infection or suppuration* demand surgical treatment.

CLINICAL VARIETIES OF JOINT LESIONS

Sprains

A sprain is a violent wrenching or twisting of a joint, producing stretching or laceration of the capsule, synovial membrane, ligaments, tendons, or periosteum, accompanied by effusion of blood or serum into the joint and surrounding tissues, and is generally the result of indirect violence. There may be all degrees of severity, from simple stretching to tearing and displacing of tendons and muscle fibres. Where the insertion of a ligament or tendon is wrenched away, carrying with it a small piece of bone, it is called a *sprain fracture*.

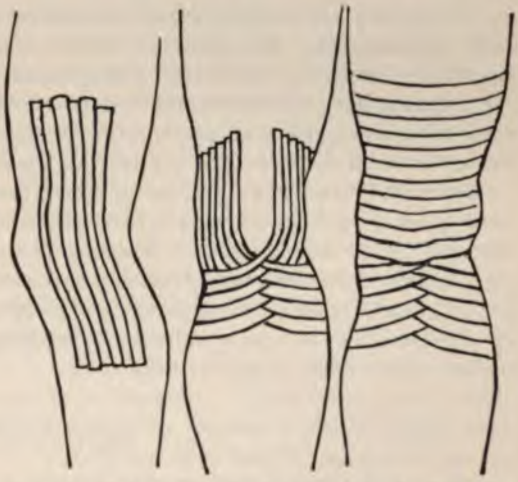

FIG. 172.—STRAPPING THE KNEE (Dr. G. H. Semken).

The **symptoms** are those of a contusion, but are more severe. At the time of the injury the pain is very severe, and may result in syncope. Ecchymosis is usual.

Diagnosis.—Use the above described methods for examination to exclude fracture. Be careful to diagnosticate the separation of an epiphysis in children.

Treatment.—In the simple cases we may need merely a supporting bandage or strapping, and later daily massage. In the more severe cases, place the joint at complete rest by means of splints or compression bandages. Anodyne liniments may be useful. Plaster of Paris or water glass bandages, after the swelling subsides, are valuable for immobilization, as are strips of adhesive plaster arranged to press, immobilize, and massage all at the same time. This massage is accomplished by having the patient use the joint after the application of the adhesive plaster. Fixation by adhesive strips allows of a certain amount of friction between the skin and the deeper parts. These measures tend to aid in the absorption of the fluid, but if they do not, it should be aspirated. Later we make use of passive motion, massage, vibratory stimulation, and hot air treatment. Forcible breaking up of adhesions under anæsthesia may be required in some cases.

SYNOVITIS

Acute Synovitis.—This is an inflammation of the lining membrane of a joint, and arises from overuse, injury, systemic infection, tuberculosis, gout, or rheumatism, or in the course of other infectious diseases. The process may excite a very slight exudation with simple flakes of fibrin, as in dry synovitis, which results either in complete resolution or in organization with adhesion; or there may be considerable effusion, thin, watery, flocculent, or hæmorrhagic. The tendency of the fluid is to become turbid from the fibrin and blood elements. Absorption may take place, leaving normal conditions, or more or less fluid may remain for some time, constituting the chronic condition called hydrops articuli, or hydrarthrosis. In the dry form there may be crepitation upon moving the joint, and the pain thus elicited is out of proportion to the severity of the inflammation.

SYMPTOMS.—Swelling, heat, tenderness pain, sometimes redness, and later fluctuation. The general temperature may be elevated. The limb is usually held between flexion and extension in the effort to limit pain.

TREATMENT.—If resolution does not take place with rest, immobilization, and cold, the joint may need surgical attention. Treat the gout, rheumatism, malarial disease, and underlying systemic diseases.

Purulent Synovitis.—If the effusion becomes infected from without or through the blood, we observe the systemic signs of pus. If pus develops, the joint must be incised and drained.

Chronic Synovitis.—In the chronic form, resulting from an unresolved acute process or from some slowly developing factor, there is usually a wider involvement of the joint structure, making it more properly an arthritis, under which head it will be described.

ARTHRITIS

All the tissues in and around a joint may be involved in an arthritis. It may develop from a synovitis, from an injury, or from specific microbes, such as those of gonorrhœa, typhoid fever, scarlet fever, smallpox, dysentery, or other infectious diseases, from gout, rheumatism, or syphilis, or from diseases of the spinal cord.

Acute Arthritis.—An acute infective arthritis is due to the entrance of pathogenic organisms into a joint. An abscess sometimes forms, but the process usually subsides without suppuration. The latter course is more common in the forms complicating the infectious fevers. Cases of infective arthritis have many points in common with cases of septic arthritis or joint abscess. The joint is painful, tender, red, and swollen, and yet does not go on to suppuration.

TREATMENT.—Cooling and anodyne lotions, ice, immobilization, cotton wadding, and splints. The disease of which arthritis is a complication should have its proper treatment.

Acute Septic Arthritis or Abscess of the Joints.—This results from the infection of a joint with pyogenic bacteria through a penetrating wound, by extension from bone or soft parts, or as a pyæmic focus. We thus observe a purulent synovitis with a breaking down or separation of the articular cartilages. The ligaments may also become softened and eroded.

SYMPTOMS.—The joint becomes red, hot, swollen, œdematous, tender, and very painful, particularly upon motion and at night. Some fluctuation appears, and the joint becomes flexed. If there is a preceding pyæmia, we observe its constitutional symptoms first, with many slight local symptoms. If not, constitutional symptoms soon develop with an initial chill or chilliness, then fever, sometimes as high as 106° F. The pulse becomes rapid, and the patients present the severe general symptoms of toxic infection, from which they may die in three or four days. A number of joints are usually involved.

The PROGNOSIS depends upon the general capability of resistance and the early treatment by free incision and drainage. As a result of destruction of the different parts of the articulation, there is a useless or only a partially useful joint remaining. As a rule complete ankylosis results. Death may occur from the severity of the infection. In pyæmia the prognosis is bad.

The TREATMENT *is surgical* by incision and drainage.

Gonorrhœal arthritis in its acute stage is likely to arise during the course of an acute or chronic urethritis due to gonococci with and without other pyogenic bacteria. The knee and ankle are most commonly involved, although other joints may be. It is exceptional to have more than one joint infected by gonococci.

SYMPTOMS.—The joint becomes swollen, red, hot, tender, and very painful. It assumes a flexed position to relieve intraarticular pressure. The pulse and temperature are usually affected. Suppuration occasionally occurs, and then there is probably a mixed infection. In the subacute and chronic stages, there may be some effusion into the joint. The inflammation usually becomes chronic, and many adhesions form in the joint, resulting in more or less ankylosis.

TREATMENT.—The urethritis should be treated. Locally, hot and cold applications are indicated. Immobilization by plaster of Paris splints has proved very effectual. Hot air treatments are very helpful in the subacute and chronic conditions. In suppurative cases incision and drainage are indicated. In order to reestablish the mobility of joints, active and passive motion, massage, and vibration should be employed. Bier's treatment has given excellent results (see Tuberculosis of Joints).

JOINT AFFECTIONS IN BLEEDERS; SCURVY AND GOUT

The joint affections with bleeders are described under Hæmophilia.

Scurvy and Joint Affections (see Scurvy).

Gouty joints are described under Gout.

ACUTE ARTICULAR RHEUMATISM; RHEUMATIC FEVER

This is an acute infectious synovitis characterized by pain in joints, tendon sheaths, and bursæ, with a tendency to invade serous membranes, endocardium, pericardium, pia mater, pleura, and peritonæum.

The joint shows an exudation of serum, rarely of pus and fibrin. An inflammation of the tonsils, pharynx, larynx, and iris is sometimes present.

The portal of entrance for the rheumatic infection is probably the nasopharynx. Gonorrhœal rheumatism finds its way into the system through the genital tract.

Prevalence.—It is seen in all climates. No race is exempt. It is a disease of early adolescence and early manhood and womanhood, the greatest liability to the disease being between the ages of ten and thirty.

Ætiology.—While rheumatism is undoubtedly an infectious disease, the microorganism of the disease has not yet been positively accepted, although several investigators have found a coccus which they think is pathognomonic of this disease.

Exposure to cold and wet seems to act as an *exciting cause.* A person who for a long period of time has worked or lived in cold and damp surroundings seems more likely to become infected. There appears to be an hereditary and personal predisposition to the disease, and having had it once predisposes to subsequent attacks. It attacks the strong and vigorous as often as it does the feeble and debilitated. It is most common in people who live in damp or ill ventilated rooms, basements, and subbasements (*house infection*).

Symptoms.—The onset may be gradual or sudden. If it is gradual, the patient will start with general malaise, headache, chilly sensations, slight fever, irritability, sleeplessness, lack of appetite, a coated tongue, and irregular pains about the joints. There may be slight soreness in the throat. If the onset is sudden, there are marked chills with a rapid rise of temperature and severe pain in one or more joints.

With the establishment of the disease the patient presents the appearance of a very sick person. The pain and tenderness are so marked that the patient lies perfectly motionless, with the joints slightly flexed, to relieve the tension within them. Usually one of the larger joints is first affected, as the knee, elbow, wrist, ankle, shoulder, or hip. The sternoclavicular, the intervertebral, the temporomaxillary, the symphysis pubis, and the sacroiliac articular surfaces are rarely affected.

The joints are swollen, inflamed, painful, and tender, and the cases differ as to severity and tenderness, the number of joints involved, and the way in which one joint after another is involved. The general symptoms are those of a marked febrile condition. The skin, however, is usually moist and the patient may be bathed in acid perspiration. This is a striking feature of acute articular rheumatism, and thus it varies from other severe febrile conditions. The skin may, however, be hot and dry. The tongue is coated; nausea and vomiting are often present; the bowels are constipated; and the urine is highly acid, diminished in quantity, and loaded with urates. The intelligence is clear, but the patient suffers greatly and is usually very irritable, restless, and sleepless. The pulse is full and rapid.

Course.—With the modern treatment (salicylic acid preparations or compounds), there is quick relief of the fever, pain in joints, and general symptoms in the majority of cases. The *duration* of ordinary cases, without complications, seems to be about three weeks, but the disease may run its course in a few days or may last for months or be protracted by relapses.

Complications.—1. *Endocarditis*, coming on within the first ten days usually, is very common, particularly in children. The mitral valves are most often affected, and then the aortic. These lesions may leave the valves permanently damaged, or the patient may go on to complete cure. The endocarditis may become chronic. Endocarditis may exist alone as the only lesion of an attack of acute rheumatism. With its development during an acute polyarthritis the patients appear worse, the temperature rises, the heart's action becomes rapid, tumultuous, or irregular, and after one or two days a murmur is developed.

2. *Pericarditis*, with the production of fibrin or fibrin and serum, usually follows the joint lesion, but may precede it or be the only symptom of rheumatism. Pericarditis seems to be more common in men. Some patients recover completely, some have permanent pericardial adhesions, while a few die from the pericarditis itself.

3. *Myocarditis*, very often present with pericarditis, is less frequent as a separate complication. The inflammations of the *pia mater*, *pleura*, or *lung* are rare and give their ordinary symptoms. The possibility of the occurrence of an inflammation of the *ciliary body* in the eye due to the poison of rheumatism must always be borne in mind.

Rheumatism with hyperpyrexia, a most fatal form of rheumatism, although fortunately rare, begins mildly or severely. After a few days of the ordinary course, the temperature rises rapidly from 105° to 110° F., with a subsidence of the inflammation of the joints. If the sweating ceases, the tongue becomes brown and dry, the pulse rapid and feeble, and the breathing rapid. Soon the patient becomes restless and sleepless, the skin becomes hyperæsthetic, and muscular twitchings develop, followed by general convulsions, delirium, coma, and death. Recovery is rare. Some authors call this *cerebral rheumatism*, and it is distinguished from rheumatic meningitis by the focal symptoms in the latter.

Complicating Features.—Some of the rarer complicating features of rheumatic disease are erythema multiforme and nodosum, roseola, urticaria, peliosis, amygdalitis, thyreoiditis, chorea, and enteritis. Rarely do we find affections of the kidneys or cystitis or urethritis of purely rheumatic origin. *Trigeminal neuralgia* may be of rheumatic origin.

The DIAGNOSIS is usually not difficult.

DIFFERENTIAL POINTS.—*Osteoarthritis* (arthritis deformans), a chronic condition, is most often seen in women exhausted by childbearing and lactation. It does not respond to the salicylates.

Pyæmia from *osteomyelitis* of the long bones, involving a joint, or from osteomyelitis of the petrous portion of the temporal bone, with a preceding history of ear disease, must be distinguished. In the joint infection of pyæmia there is no shifting of the pain from joint to joint; the skin is not moist; the ulcerative endocarditis gives its peculiar temperature curve; the spleen is frequently the seat of infarct with its symptoms of tenderness and enlargement; and the kidneys may have infarcts, with albumin and blood in the urine.

Gout usually attacks the metatarsophalangeal joints, and has gastric and other symptoms, with no involvement of the heart.

Scurvy and *rickets* are usually diagnosticated by the history of improper food or malnutrition.

Hæmorrhage into a joint may occur in hæmophilia.

Monarticular rheumatism is usually characteristic of gonorrhœal infection. Look for gonococci in the urethra. If there is pain in the vertebræ, we may diagnosticate rheumatism by the medication test, viz.: with sodium salicylate.

Multiple neuritis begins with severe pain in the extremities and along the course of the nerves.

Hysterical joints exist in people who show other signs of hysteria. In such cases fever and swelling are absent.

MANIFESTATIONS OF RHEUMATISM IN CHILDREN

The joint affection is not so pronounced in children as in adults. We may have simply the *mild growing pains*, or there may be no joint pain. Occasionally the joint symptoms are quite severe. The other manifestations, however, are more frequently found in children—torticollis, erythema nodosum, purpura rheumatica, chorea, endocarditis, pericarditis, myocarditis, or the formation of tendinous nodes. Rheumatic affections in children must be distinguished from *syphilitic*, *scorbutic*, and *rhachitic* inflammation at the epiphyses, *acute osteomyelitis*, and *septic arthritis*.

Endocarditis is the complication most frequently found in the case of children.

Course and Termination.—Some patients recover completely and never have another attack; in some it runs its course, but leaves one joint inflamed; some have a long convalescence, become feeble and anæmic, and have stiff and tender joints for an indefinite time; pericarditis and endocarditis may result in serious permanent heart lesions.

Death in acute rheumatism is not frequent. It may be due to *hyperpyrexia, meningitis, pericarditis, endocarditis, pneumonia, pleurisy,* etc.

Treatment in Rheumatism.—The patient should be put to bed and not allowed to be up, no matter how mild the case is, until the acute symptoms have all disappeared. The following initial dose should be given to adults:

℞ Podophyllin,		gr. ¼;
Calomel, Quinin. sulph.,	āā,	gr. x;
Pulv. aromatic.,		gr. iij.

In a wafer.

Constitutional Treatment.—*Salicylic acid*, gr. x to xx; *sodium salicylate*, gr. x to xx; *salol*, gr. v to x; *salophen*, gr. v to x; *oil of wintergreen*, ♏ x to xx, in a capsule or in milk, or *aspirin*, gr. v to x, may be given every two hours until slight deafness and tinnitus aurium result, when the dose should be gradually reduced. The fever and pains often disappear under this treatment in from two to five days. The doses should not be too small or discontinued too soon, as recrudescences may appear. Careful watching is necessary to perceive the first toxic symptoms of the drug employed, gastric disturbances, delirium, cardiac weakness, albuminuria, and a tendency toward hæmorrhages. Children receive the same treatment in smaller doses.

The ALKALINE TREATMENT was designed for fat subjects, for those suffering from disturbances of digestion, or for gouty persons. *Fuller's alkaline* *treatment* is as follows: Potassium bicarbonate, ʒj every three to four hours, adding ʒj of lemon juice each time, and diluting with a considerable quantity of water. Continue it until the urine is alkaline, which usually takes from three to five days. Then give only gr. xxx of potassium bicarbonate in lemon juice and water as before, in combination with gr. ij to iij of quinine. Continue this for a long time. It is alleged that a patient is less liable to endocarditis with this treatment.

The salicylates may be given in combination with the alkaline treatment or in combination with iodide of potassium and aconite or veratrum viride, particularly in cases with a very rapid action of the heart.

℞ Sodii salicyl.,	ʒij;
Potass. iodid.,	ʒj;
Tinct. veratr. virid., Tinct. aconit. radic., } āā,	gtt. xv;
Aquæ,	℥ij;
Syrupi,	ad, ℥iij.

M. S.: A teaspoonful every two hours for adults. One half a teaspoonful every two or three hours for children.

Local treatment to the joints gives relief to the patient. The part may be encased in cotton and by means of splints rendered immobile. Oil of wintergreen, applied thickly and covered with rubber tissue, gives relief. Hot or cold applications, according to the choice of the patients, are used. Plaster of Paris splints are sometimes employed.

The pain may be so severe as to require *morphine* or the coal tar analgetics. The *diet* should be a *fever diet*. Enteroclysis should be done daily.

Hyperpyrexia demands *wet packs* or *cool baths*. No time should be lost in reducing the temperature.

The patient should be kept in bed for at least six weeks in severe cases, and the alkaline treatment should be continued for some weeks after the cessation of acute symptoms, or five drops of *dilute hydrochloric acid* may be given three times a day, in water. Anæmia demands iron. Undue exertion of the joints should be avoided, and the diet should gradually be made more liberal. A change of environment is often indicated.

The hot air treatment, so beneficial in chronic joint pain, may also be employed in subacute articular rheumatism. *Massage* and *vibration* are also indicated after the acute symptoms are over. In protracted cases with persistent effusion, incision and drainage of a joint may be indicated. Adhesions may have to be broken up, if necessary under anæsthesia.

Treatment of complications and sequelæ is discussed under their respective headings.

ARTHRITIS DEFORMANS

Rheumatic arthritis, *osteoarthritis*, and *chronic polyarthritis* are used by different writers as synonyms.

Definition.—A peculiar progressive inflammation and degeneration of the joints, accompanied with atrophy of some of the structures and hypertrophy of others. Usually the parts involved are irrevocably damaged.

Arthritis deformans as seen in children presents no difference from the disease in adults, although it is rare.

Pathology.—There is from the outset a slowly advancing chronic inflammation, with degeneration of all the structures of the joint, a panarthritis. It may begin in the ends of the bone or in the cartilage, with primary proliferation and afterward absorption. The changes in the bones are confined to the epiphyses. Later, denudation of the bone takes place at the point of maximum pressure. Friction gives the ends of the bone a smooth, lustrous, eburnated appearance.

The proliferation of the cartilage from the inflammatory process causes it to undergo a fatty degeneration, becoming softened, eroded, and destroyed. The cavity of the joint may become so enlarged as to allow of a dislocation. The joint may become stiffened. The synovial membrane becomes thickened, adhesions may form, and there may be an increase in the amount of synovia, which becomes cloudy and thin, mixed with ground down particles of cartilage. At times there is an absence of synovial fluid. Thick plates of bone may form as a result of an ossification of the capsule, flat or rounded or like stalactites. Parts of bone may become detached and remain isolated or unite into bony masses. Overlapping protuberances of proliferated cartilage or bone, form the nodules which are characteristic of one variety of the disease. A striking pathological change is the great proliferation of the joint villi. These become absorbed later on.

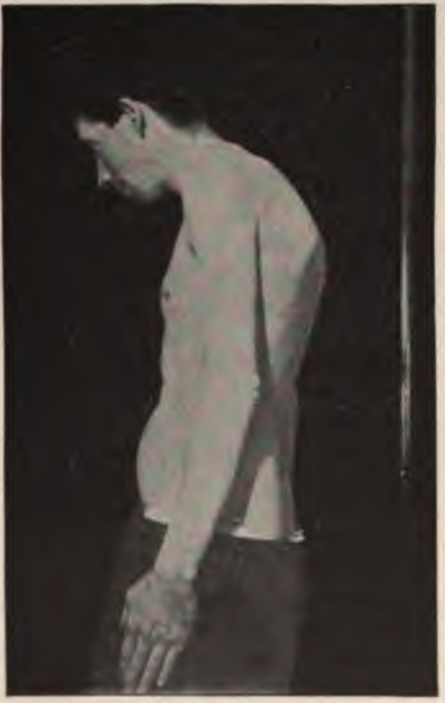

FIG. 173.—ARTHRITIS DEFORMANS OF SPINE.

The muscles entering into the joint mechanism show after a time decided atrophy, and the tendons become stretched and thinned. The interossei, the shoulder muscles, and the muscles of the thigh and calf of the leg may show atrophy. There may be dystrophy. *Neuritis* of the peripheral nerves has been found.

The **ætiology** is obscure. In some instances the lesion occurs after rheumatic fever. Whether the original acute process is a true acute rheumatism or whether it is an acute beginning of arthritis deformans does not seem to be settled.

Varieties of the Disease.—Heberden's nodes, the general progressive form, the partial, or monarticular, form.

HEBERDEN'S NODES.—They may be regarded as the slightest and most chronic manifestations of *rheumatoid arthritis*. There may be a nodular involvement of the metacarpophalangeal joint of a thumb or occasionally of the dorsal aspect of the joints of the fingers. The disease becomes quiescent or extinct after a certain advance, but the marks remain. They are much more common in women than in men.

THE GENERAL PROGRESSIVE, OR POLYARTICULAR, FORM.—The hands are usually first affected, but the feet may be. It seems as if those joints which had been used most were the ones first involved. It is usual to have the joints involved one after another, advancing toward the trunk. The temporo-maxillary joint, rarely attacked in other arthritic conditions, is involved in this disease in about one fourth of the cases. Usually the disease is symmetrical. The articulations of the spine become affected later in the disease, the cervical region first, when it may remain, or the dorsal and lumbar regions may follow. This renders the back bent, twisted, shortened, and *rigid*. A complete ankylosis of the spinal column and hips, so that head, trunk, and thighs are firmly united, is occasionally seen.

The PARTIAL, OR MONARTICULAR, FORM is seen, where the knee, hip, and spinal column may be involved. It is apparently brought about by an injury and senility—senility not signifying so much old age as it does that morbid condition brought about by wear and tear, which is shown by changes in other parts of the body. If the hips are involved, the knees and lumbar and lower dorsal vertebræ may follow; if the shoulder is diseased, the elbows are likely to follow. When the hip alone is involved, it is the *malum coxæ senile* of the older writers.

There are many indefinite modes of onset, and no malady is more insidious in its invasion. The disease may be well advanced before a suspicion of its presence is aroused, which demonstrates the importance of early recognition. Actual joint disease begins with stiffness and pain, aggravated by motion or pressure. When the invasion resembles that of rheumatism, a swelling appears, and the joint becomes bulging and tender. The distal joints usually are the first affected. Sometimes only the distal phalangeal joints are attacked. The interphalangeal joints swell and give characteristic spindle-shaped joints.

This is the way the disease invades many of the young adults, and it may not advance for months or years. The thumbs may escape, or only the carpometacarpal articulations become involved. The foot quickly shares in sympathy with the hand. The tarsal bones enlarge and become tender, synovial effusion takes place, the elasticity of the plantar arch is lost, and even slow walking becomes painful. The knee is likely to be more severely affected. A limitation of movement and a grating noise upon bending and rubbing the articular surfaces together are proofs of a destroyed mechanism. The crackling of periarticular adhesions is characteristic. Restrictions of motion by these adhesions may be as abrupt as if the bones themselves were at fault.

ATROPHY OF MUSCLES is uncertain in degree. It may be an early symptom of joint trouble, synchronous with or preceding the joint symptoms. It may be out of all proportion to the joint trouble.

The *skin* about the joint may show dystrophy, becoming *pink* or *glossy* or *translucent* and *pale*. The flexor side of a finger may become thin and brittle, and the nutrition of the nail may suffer.

Resultant Deformities.—In younger people, the fusiform appearance of the fingers is mostly due to synovial thickenings and thickening of the soft parts, while the Heberden nodes are osteophytic outgrowths. Bursal swellings are not uncommon in the neighborhood of joints, particularly on the dorsal aspect of the wrist, and enormous cysts have occasionally been met with in the thigh in connection with arthritis deformans.

Spasm of the atrophied muscles may cause flexion of limbs at the knees or elbows and in extreme cases grotesque deformities of the hands and feet. The atrophy of the muscles about a joint makes the bony deformity more apparent. The bases of the first phalanges are directed obliquely to the ulnar side, so that the fingers assume more and more the appearance of subluxation. Often the phalangeal joints are so distorted that the second phalanx of the finger is markedly extended while the terminal phalanx is flexed. The palm of the hand is frequently hollowed out.

The feet exhibit analogous deformities, but seldom to as great an extent as the hands do. Subluxation of the hip joint is not infrequent. The motion of the shoulder joint becomes more and more impaired as time advances. With the progress of the disease in the lower joints walking becomes more and more painful, and later impossible without help or without crutches.

General Course of the Disease.—It is an extremely chronic infirmity, lasting over ten or twenty years or longer; although there is continual advancement, there are sometimes periods of apparent arrest of the process which may extend over many months. There may be remissions and exacerbations affecting either the general or the local manifestations. *Cardiac, kidney, glandular*, and other constitutional symptoms are absent.

Prognosis.—It is unfavorable. Recovery is extremely rare, and is possible only in the early stages. For the encouragement of the patient it may be said that, under proper care and treatment, the disease often runs so gradual a course that the general condition remains at least bearable for a very long while, although there may be considerable local disturbance.

Termination.—The disease is not directly dangerous to life. The eventual fatal termination ensues either from general debility or from some intercurrent disease.

Differential Diagnosis.—In the invasion the differential diagnosis between chronic rheumatism and arthritis deformans is very difficult. It is easier if we note in the beginning that in *chronic rheumatism* the inflammation attacks the connective tissue structures first, giving the characteristic crackling upon passive motion. This is never present in arthritis deformans. In the *vertebral column* it is still more difficult, although the final result is the same in both, namely, ankylosis. In *arthritis deformans*, during the early stages, knotty, bony clasps develop on the borders between two vertebræ, while in chronic rheumatism the ankylosis begins as a connective tissue adhesion between the borders of the vertebræ. This later may become bony.

DIFFERENTIAL DIAGNOSIS BETWEEN

ARTHRITIS DEFORMANS AND	CHRONIC RHEUMATISM
More common in women.	Seen about equally in both sexes.
No history of acute rheumatism.	History of acute rheumatism.
In poorly nourished people.	Frequent in well nourished people.
Pain mostly upon motion.	Pain more or less constant.
Disease progressive.	Periodical attacks.
Small joints first attacked.	Large joints first attacked.
Temporomaxillary joint often attacked.	Seldom if ever attacked.
Deformity symmetrical.	Not symmetrical.
Weather seems to have no effect upon it.	Disease is worse in cold damp weather.
Increased diet improves the patient.	Increased diet apparently has no effect.

For the differential diagnosis between arthritis deformans and gout, see the chapter on Gout.

The progressive joint lesions of organic nervous lesions present associated nervous phenomena which enable us to distinguish between it and arthritis deformans. The same may be said of *joint syphilis* and *joint tuberculosis*. *Gonorrhœal arthritis* presents a different picture entirely.

Treatment.—That the treatment of arthritis deformans may have any chance of success, the following requirements must be complied with: 1. It should be begun as soon as possible after the appearance of the earliest signs of the disease. 2. It must be such as to increase the patient's strength, and all opposite measures must be avoided. 3. To be effectual, it must be carried on for months or even for a year or two with short intermissions.

PROPHYLAXIS.—Hygienic living in the strongest sense of the term is the best preventive of this disease; sufficient and proper nutrition, regular sleep, exercise, bathing, and amusement. If one's occupation is tiring to one's hands and fingers by reason of forced and unnatural positions, there must be a corresponding change and relaxation. The dwelling house should be dry and warm, but not of a nature to lessen one's power of resistance. After the onset, the strictest rules of hygiene must be followed. The most wholesome and abundantly nutritious diet must be allowed; regular exercise, sleep, and amusement must be insisted upon.

Climate.—A dry and temperate climate seems most favorable.

Baths are of undeniable value, although they must not be overestimated. Simple warm baths or salt baths (two to ten pounds of salt in each bath) may be used in any home.

The following resorts for bathing and drinking are considered best for cases of arthritis deformans: Teplitz, Wildbad, Ragatz, and Baden in Switzerland (warm baths); Wiesbaden (warm chloride of sodium baths); Oeynhausen and Nauheim (acidulated baths); and Elster, Marienbad, Franzenbad, and Schmiedeberg (mud baths).

Steam baths may be employed cautiously in the early stages where the general health is still good. In this country the baths at Sharon and Richfield in New York State, the Sulphur Springs of Virginia, and the Hot Springs of Arkansas are recommended. Hot sand baths have been known to do good, not only from the temperature, but from the uniform and continuous pressure. They are given elaborately at Kostritz and Blasewitz.

Hot air treatment, such as is given in hospitals and may be given in the home of the patient, is as efficacious as any form of bath.

Enteroclysis with hot water (110°) should be practised daily.

Drugs.—We always administer drugs internally with the hope of modifying the disease, but the chief reliance is placed upon local treatment. Iodine, the iodides, and arsenic stand first. Iodine may be given in the form of the tincture, a few drops in mucilage several times a day or, better, in combination with potassium. Arsenic has given benefit. It may be administered in the form of pills of *arsenious acid*, gr. $\frac{1}{30}$ to $\frac{1}{15}$ two or three times a day for several months. *Salicylic acid and antipyrine* may be used in acute exacerbations to alleviate pain. Colchicum seldom does any good. Iron and quinine may be indicated. Hyoscyamus has been found of value in the attacks of acute paroxysmal pain. Ichthyol might be tried for its disinfecting qualities in the intestinal tract in two drop doses three times a day. Diphtheria antitoxine and ductless gland preparations have been used in arthritis deformans.

LOCAL TREATMENT.—By means of local treatment and baths we apparently accomplish more than by internal medication. *Massage* comes first, although the resulting benefit is likely to be evanescent. To aid in the absorption of inflammatory products, to loosen up joints, to invigorate the muscles, and improve the general health, massage is temporarily of great benefit. It must be continued for a long time, but if too long, it seems to do harm rather than good. *Continued dry massage* seems to do more good than a short course of douche massage. Vibratory massage is excellent.

Superheated dry air probably offers better chances for improvement than any form of medication. *Liniments, ointments,* and other local remedies seem to be of benefit only from the accompanying massage. The deformities may require surgical interference.

CHRONIC RHEUMATIC ARTHRITIS; CHRONIC RHEUMATISM

This is a result of repeated acute attacks, or it may gradually begin as a chronic inflammation in persons constantly exposed to cold and dampness or suffering privation.

The **treatment** consists in protection from moisture and cold; in improving the general health and in intestinal irrigation. Massage, dry heat, vibratory stimulation, and electricity in combination with tonics are beneficial. Contractures and adhesions may be benefited by surgical measures.

Syphilitic Arthritis

In acquired and congenital syphilis, there may be arthritis. The pain is not severe, the systemic symptoms are not marked, and the enlargement of the joints is not uniform, but shows doughy areas. The skin is not red nor does it show any signs of inflammation. The treatment is antisyphilitic.

TUBERCULOSIS OF THE JOINTS

The *exciting cause* may usually be traced to some injury, such as a sprain, blow, twist, or exposure, but sometimes there seems to be no exciting cause. In adults we find tuberculosis of the synovial membranes more frequently, while in children it attacks usually the bones. There may be an active hyperæmia, with swelling, or the process may develop more slowly, with congestion, œdema, and the abundant development of granulation tissue. This latter may cause a baggy condition of the whole synovial sac, with little or no effusion into the joint. Hence, in this form, great deformities may exist. Effusion is marked in other cases, with much less development of granulation tissue.

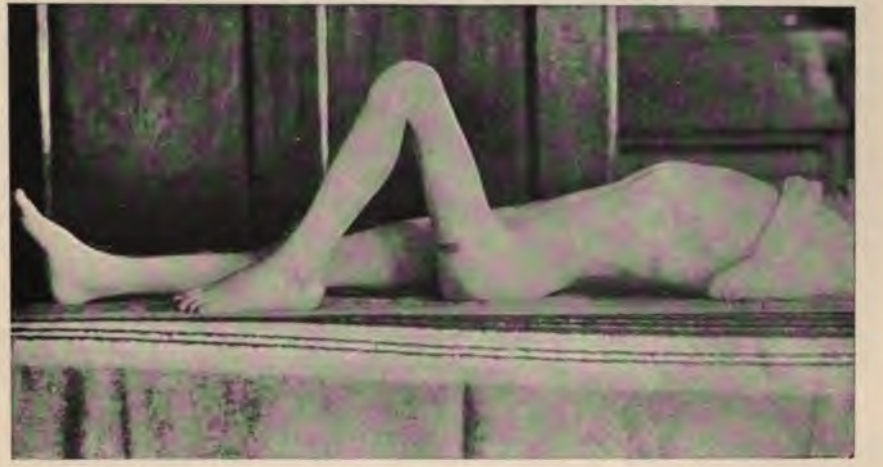

FIG. 174.—HIP DISEASE SHOWING FLEXION DEFORMITY.

Symptoms.—The swelling at a joint gradually becomes spindle-shaped. The skin becomes white and thick (white swelling) and the presence of fluid, serum or pus, will give fluctuation. Pain is usually slight, there being more when the disease begins in the bone. It can be elicited by pressure or by certain motions. There may be a slight rise of temperature and the joint may feel warm to the touch. Deformity from swelling, from softening and degeneration of the ligaments, from muscle spasm and atrophy, and from the tendency to assume certain attitudes as a means to relieve pain, is present.

The *muscular spasm,* a reflex action producing rigidity of the joint, is one of the first and most important symptoms. The function of the joint gradually becomes affected. With fatty and caseous degeneration and the accumulation of tuberculous fluid, perforation, with the formation of sinuses, may take place. Systemic infection is possible at this time.

Diagnosis.—There is often the hereditary taint in these cases. Tuberculous joints most often occur in the quite young and quite old. The process may be confounded with syphilis in the young, but there will usually be other evidences of syphilis. It is very difficult sometimes to determine whether the disease was primarily in the bone or in the synovial membrane. If it is primary in the bone, and not far advanced, the loss of function, swelling, and muscular resistance may be so little marked as to make the diagnosis difficult. The circumscribed point of tenderness, corresponding to the original focus, is an aid in diagnosis. By means of an x ray print we can demonstrate a tuberculous focus.

Prognosis.—The extent of the local disease and the general health of the patient largely influence the prognosis. Healing of a joint may occur with slight or complete ankylosis. There may be abscess formation with necrosis of the ends of the bones. The patient may die from general tuberculosis. Some cases run a course for years and finally end in recovery, with more or less ankylosis. If we recognize the first of the three stages, muscular spasm, we may be able to bring about healing with very slight ankylosis. The two other stages, effusion or granulation and abscess, mean more destruction.

Treatment.—Spontaneous cure is rare. Complete rest is of the greatest importance, combined with fixation and general climatic, hygienic, and tonic treatment. *Bier's treatment* consists in creating congestion of a joint by applying an elastic bandage above. For example, if we have to deal with a tuberculous knee joint, we should put on a spiral circular rubber bandage, having the rubber on the stretch, above the knee, with a layer of flannel adjusted smoothly underneath. The pressure must be moderate and the treatment must be continued for months, the bandage being left on for hours at a time. In many cases surgical treatment will be necessary.

LOOSE BODIES IN JOINTS

These are composed of bone, fibrocartilage, or fibrous material, and are met with occasionally, most often in the knee joint. They may be free in the joint or attached by a pedicle. They originate from portions of bone or cartilage detached by injury, from the synovial fringes or from detached osteophytes, and vary in size usually from that of a pea to that of a lima bean. Occasionally one may be even larger. Blood clot may organize into fibrous bodies. An x ray print will demonstrate loose bodies in joints.

Symptoms.—There is usually, first, a sudden severe pain in the joint with apparent inability to move it in any direction. Nausea and even vomiting may be present. Soon signs of fluid may develop. After a few days usually all symptoms disappear, due to a change of position of the foreign body. Sooner or later, perhaps months later, the body may again be wedged between the articular surfaces and cause the severe pain. Sometimes patients may feel the foreign body slipping around in the joint, and sometimes flexion and extension will dislodge it. Sooner or later a looseness of the joint results from stretching and synovitis develops.

The **treatment** is palliative and operative. A close fitting bandage or knee cap sometimes suffices to keep the body from slipping between the articular surfaces.

DISPLACEMENT OF THE SEMILUNAR CARTILAGES

This accident may happen to these cartilages of the knee joint by injury or by the weight of very heavy people. The displacement may be slight or the cartilage may be set entirely free, enabling it to become wedged between the tibia and femur, firmly locking the joint.

Symptoms.—There is a sudden pain, the knee becomes partially fixed, and the joint is locked. Nausea and vomiting may result from the severe pain. Swelling and effusion may appear. All the symptoms recede with reposition of the cartilage. After such a stretching, we observe an abnormal lateral mobility of the joint, and the ligamentum patellæ is often elongated. When the knee is slightly flexed, there is a slight twisting motion, and this is largely effective in producing the dislocation. A semilunar cartilage once displaced is therefore likely to slip again.

Treatment.—Flexion and extension, with slight rotation, will usually suffice to replace it. An anæsthetic may be required. If an apparatus is constructed and worn to prevent complete extension, lateral motion, and separation of the inner condyles, such as the Shaffer apparatus, a recurrence can usually be avoided. Operative measures may be necessary.

NEOPLASMS OF JOINTS

Primary new growths in joints are rare, but we see metastases rather often. Sarcomata and chondromata are the most frequent and require surgical treatment.

NEUROSES OF JOINTS

Hysteria manifests itself in joints in the form of painful conditions or contractures.

Neuralgic conditions, due to neurasthenia, malaria, disease of the brain or spinal cord, or injury or pressure upon nerves supplying a joint, are often met with. There is no apparent pathological change, and function may be perfect, although we see such pains in a joint after recovery from an injury, such as sprain or contusion. The pain is of a burning or lancinating character, and is most apparent when the patient is fatigued.

The **treatment** is with massage, hot dry air, vibratory stimulation, etc., combined with general tonic treatment. The actual cautery is of benefit in hysteria.

NEUROPATHIC ARTHRITIS

Charcot's joint, or **neuropathic arthritis,** affects a large joint, particularly the knee. It begins acutely with effusion, but without pain or rise of temperature. Later there is a degeneration of the cartilages and surrounding structures, often with great enlargement of the ends of the bones, a change similar to that in arthritis deformans. There is a grating of the joint surface, with much mobility, often leading to partial or complete dislocation. Muscular atrophy is rapid, and degeneration of the bone in this region may lead to fracture from trivial injury.

TREATMENT.—As this is a symptom of locomotor ataxia, the only benefit we may hope to give is from treatment of that disease. The joint should be protected to prevent dislocation and fracture. *Spontaneous dislocation of joints* is occasionally observed in flabby, anæmic individuals without the neuropathic element.

BURSITIS

The bursæ connected with tendons or joints or situated elsewhere are the seat of injuries or inflammations from continued friction or pressure.

Acute bursitis presents tenderness, pain, redness, and distention of the bursa. Should suppuration arise, the surrounding tissues may be involved, and as the deeper bursæ may connect with or be closely associated with a joint, the condition may become quite serious. The location of the swelling and its globular shape suffice for the diagnosis.

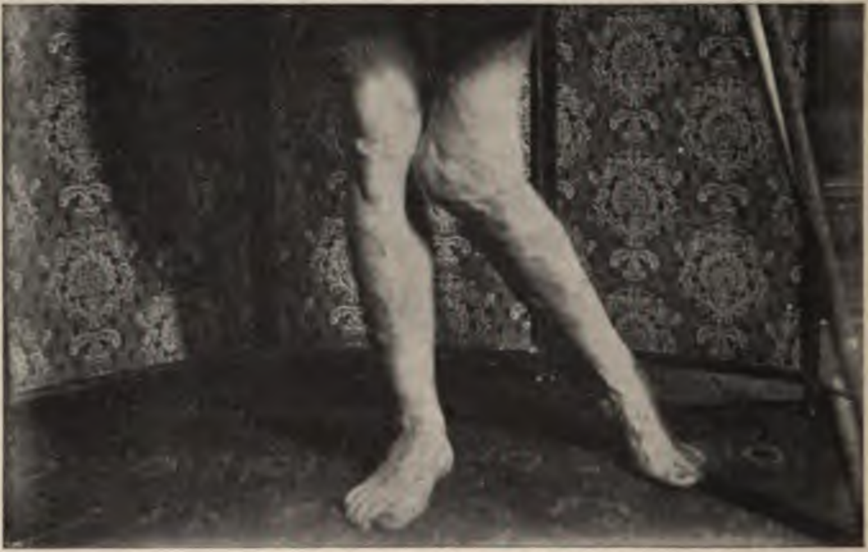

FIG. 175.—CHARCOT KNEE JOINT (Tabes Dorsalis).

The TREATMENT consists in rest, elevation, pressure, or cold, and possibly a splint. If there is suppuration, surgical treatment is required.

Chronic bursitis, from a non-suppurative acute bursitis, or developing slowly from long continued irritation or pressure or from tuberculosis, exists with no, or very slight, pain. The sac is distended with fluid, and may become so thickened as to form a solid tumor. *Housemaid's knee,* or a *chronic præpatellar bursitis,* from frequent and long continued kneeling; *miner's elbow,* an inflammation of the olecranon bursa; and *bunion* are the forms most frequently seen.

DIFFERENTIAL DIAGNOSIS.—*Gummata* of the præpatellar bursæ are common, and this condition should be suspected. Ganglion is probably a cyst arising from the sheath of a tendon or from the tendon itself and not connected with bursæ or synovial membranes (see Diseases of Tendon). The location should determine a bursa.

The TREATMENT is surgical.

CHAPTER XXII

OSSEOUS, MUSCULAR, AND ARTICULAR SYSTEM—*Continued*

DISEASES OF MUSCLES, TENDONS AND FASCIÆ

Synopsis: Muscles: Remarks on Injuries, Degeneration, etc.—Myalgia (Traumatic and Rheumatic).—Wry Neck.—Lumbago.—Backache.—Cramps in Legs.—Myositis.—Trichinosis of Muscles.—Myotonia.—Myoclonia.—Muscular Dystrophies.—Tendons: Injuries.—Lengthening and Transplantation of Tendons.—Suppurative Tenosynovitis, Tuberculous Tenosynovitis.—Tumors of Tendons.—Fasciæ.—Injury and Contracture.

THE MUSCLES

Injuries.—Muscles are subject to incised, lacerated, and contused wounds. The latter may be subcutaneous. The injury may be direct from without or due to sudden forcible contraction. In every instance there is more or less disturbance of function.

Rupture, complete or partial, may take place in a muscle and may be associated with great pain and loss of function, and, in case a large muscle is involved, with complete rupture, a deformity presents itself at the site of rupture, due to contraction of the two ends, with a furrow between them. A form of *wry neck*, a condition known as *congenital tumor of the sternocleidomastoid,* may be the result of a partial rupture of this muscle during a difficult labor (see Pædiatrics).

Strains and Sprains.—Simple stretching or laceration of a few fibres of a muscle is of frequent occurrence. Some loss of function may result. Repair takes place with the formation of fibrous tissue.

Treatment.—Incised and lacerated wounds and complete ruptures demand surgical treatment. Strains and sprains call for rest, suitable splints, strapping or bandaging, and early or subsequent massage and vibration treatment.

Degeneration of Muscle.—A fatty degeneration largely confined to the connective tissue may result from long continued inflammation or disuse.

Intrinsic fatty degeneration of the muscle fibres themselves, a more complete form of degeneration, is occasionally seen.

Granular, waxy, and calcareous degeneration are observed from time to time. In rhachitis the muscles are flabby from imperfect nutrition, and sometimes atrophied from disuse.

The treatment consists in passive motion, vibration, massage and electricity, and proper diet.

Ossification of a portion of the belly of a muscle at its insertion, as a result of long continued irritation, is sometimes seen. The "rider's bone," a calcareous deposit in an adductor muscle of the thigh, occurs in those who ride horseback constantly.

Atrophy of muscles from severe injury, following disease of a joint or of the spine, or from contusion, is often seen. It may be associated with fatty degeneration. It is a prominent symptom in progressive muscular atrophy.

Hypertrophy is either an actual increase in the size and number of muscle fibres, seen as a result of excessive use, or it is due to increase in the connective tissue, lymphatics, or blood vessels of the muscle.

Contracture of muscle, a permanent shortening, may be caused by inflammation, loss of substance, disease of joints, paralysis of the opposing muscles, cicatricial contraction, and disease of the central nervous system. Hysteria and chorea may cause a temporary shortening by contracture.

The TREATMENT is described in the chapter on Orthopædics.

Tumors of Muscle.—These may be benign or malignant. Among the former we find syphilitic, fibrous, cystic, vascular, cartilaginous, and osseous growths. Cysticercus cysts are rare. Malignant tumors, carcinomata and sarcomata, of muscle are not uncommon. The treatment depends upon the nature of the growth. Surgical interference is usually necessary.

Myalgia; Pseudorheumatism.—Until our pathology of this subject is rendered clear, these terms may be used interchangeably. They express a painful condition of a voluntary muscle, which may be due to trauma, a slight strain, a twist, or a laceration. In such cases there is probably a slight inflammation of the muscular tissue. It may also be caused by infectious diseases, such as syphilis or malarial disease, or it may be due to intoxication by alcohol, mercury, or lead.

Muscular rheumatism, or rheumatic myalgia, is probably caused by the same infective agent which produces acute articular rheumatism. It apparently arises from the same predisposing causes as the arthritic type.

In some cases *fibrous nodules* are found in the affected muscles. No muscle is exempt, but the ones most frequently involved are the quadratus lumborum (*lumbago*), the sternocleidomastoid (*acute wry neck*), and the intercostals (*pleurodynia*). Appendicitis and cholecystitis are sometimes mistaken for rheumatism of the abdominal muscles, and vice versa.

The prominent symptom is pain in the muscle affected, with or without a rise of temperature. Each contraction of the muscle is likely to be agonizing. Complications, such as endocarditis and the cutaneous lesions: petechiæ, erythemata, urticaria, and peliosis, have been observed, but are not ordinarily seen.

The TREATMENT is antirheumatic in the acute stage, with rest, heat or cold, or strapping. Massage or vibratory stimulation is indicated, and it is especially efficacious when nodules are found.

Lumbago.—A common and painful affection of the muscles of the loins of traumatic or rheumatic origin, with sudden onset lasting from a few hours to several days.

TREATMENT.—A hypodermic injection of morphine (gr. ¼ to ½) over the seat of pain will give prompt relief. This is to be followed by massage and vibratory massage. Rest of the affected muscles will generally prolong the trouble. In chronic cases hydrotherapy and massage are indicated.

Torticollis, besides being rheumatic or malarial in origin, may be due to an injury during childbirth, affecting either the nerves or muscles. It may also follow a lateral curvature of the spine as a compensatory distortion. A new growth in the sternomastoid, a gumma, or a sarcoma may cause torticollis. Abscess of the neck, enlarged cervical glands, or hysteria may give rise to this condition. The trapezius may be involved with the sternomastoid, and occasionally the splenius, scaleni, and platysma are involved.

TREATMENT.—(1) Medicinal, (2) mechanical, (3) operative, all of which is described in the chapter on Orthopædics. Where it appears as an acute condition, rheumatic, or from some other infection, commonly described as a *stiff neck,* a forcible bending in the opposite direction, a painful procedure, will often give immediate and permanent relief. When the underlying cause is unknown, we may begin treatment by giving first a laxative and subsequently quinine or salicylate of sodium, to be followed by manual or vibratory massage.

Backache is not usually of muscular origin, but may be due to many causes, such as arthritis deformans and Pott's disease, and injuries to and strains and sprains of the dorsal ligaments. From lateral curvature there also occurs a straining of ligaments. Faulty position in standing and walking is a frequent cause. In consequence of weakness and fatigue, the weight of the body is allowed to rest upon the ligaments of the vertebræ instead of the spinal muscles. We see, as characteristic of this, people with round shoulders, head thrust forward, abdomen protruding, and a shiftless, waddling, and ambling gait. Flat foot, pronated foot, a condition in which there is a tendency of a normally arched foot to bend inward, and contracted foot, when for some reason the muscles of the calf are contracted, are mentioned as being somewhat common causes, also diseases and atony of the muscles, and neurasthenia and hysteria. In the pelvis, there may be pressure upon the sacral nerves from any cause, frequently from *constipation.* Malposition of the uterus, most often retroflexion, by pulling upon the posterior ligaments, is a frequent cause of backache in women. Affections of the cervix uteri, principally new growths, are mentioned as causes. Backache is a usual symptom of infective fevers and intestinal intoxication.

TREATMENT.—Injuries and sprains of ligaments demand rest and fixation and possibly orthopædic attention, as do also tuberculous affections and deformities of the foot. Faulty position calls for tonic treatment, exercise, and gymnastics. Backache in women is usually cured by wearing an abdominal supporter and taking a laxative pill at bedtime.

Cramps in the legs are due to many causes. They are very troublesome in cholera, gout, and chronic Bright's disease. They are observed frequently in conditions of varicose veins, flat foot, and contracted foot. The treatment must be directed to the underlying cause.

Myositis as a primary disease is very rare and of unknown cause. It is characterized by swelling, tenderness, and stiffness of the muscles, associated with pain on motion. There may or may not be œdema of the subcutaneous tissue. Frequently there are resemblances to an acute infection. The course is from several months to several years, and no curative treatment is known. The affection may become of a serious or fatal nature by involving the muscles of respiration and deglutition. In that it simulates trichinosis, we can distinguish it only by microscopical examination of the muscle fibres.

Acute purulent myositis, usually associated with pyæmia, occasionally with other septic conditions, resembles purulent inflammations in other parts of the body. It has been looked upon in a few cases as primarily an acute infection.

Myositis ossificans is a rare progressive disease in which the muscles become bony. It may be limited to certain muscles or be general.

Myositis Due to Trichinosis.—A localized inflammatory condition of a muscle caused by the *Trichina spiralis* becoming encysted in the substance of the muscle. The parasite's habitat is the hog. When its meat is eaten raw or imperfectly cooked, the parasites develop in the intestinal tract and migrate to the muscle, which they reach on about the sixth day. Within the capsule which they form for themselves in the muscle they may live for years.

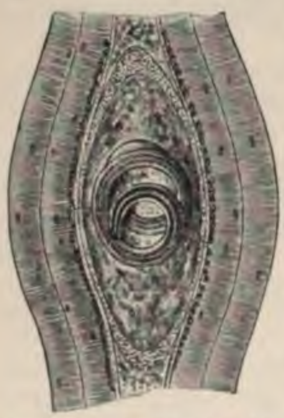

FIG. 176.—TRICHINA SPIRALIS ENCYSTED IN MUSCLE.

SYMPTOMS.—The first to appear are the gastrointestinal symptoms, which manifest themselves one or two days after eating the diseased pork. There are nausea, vomiting, abdominal pain, and a serous diarrhœa. The worms, resembling glistening white threads, may be found in the stools. In some cases typhoid fever or cholera may be suspected in the presence of high fever. Very severe cases may terminate fatally in the early stage, probably from intense intoxication.

Muscular symptoms develop in from one to two weeks. The muscle becomes swollen, tender, and exceedingly painful. The skin over the muscle may be œdematous. If the respiratory muscles are involved, dyspnœa occurs and there is a liability to the development of bronchitis and bronchopneumonia. One of the most characteristic early symptoms is *œdema of the eyelids,* usually appearing by the seventh day. Irregular fever, profuse sweating, albuminuria, and loss of reflexes are usually present.

The DIAGNOSIS is made from the history of the patient's having eaten raw or improperly cooked pork, from finding a number of persons suffering at the same time, and by examining the stools, or later in the disease an excised piece of muscle. Eosinophilia has been found in the majority of cases.

The COURSE is from two to eight weeks, and recovery is slow and tedious.

The PROGNOSIS is grave, as about 30 per cent of the patients die, chiefly from pulmonary complications.

The TREATMENT is prophylactic, by avoiding raw or poorly cooked pork. In the gastrointestinal stage, give a brisk purgative. Calomel, gr. x, or glycerine, in ℨss doses, every hour, and thymol, in gr. v doses, in a capsule have been recommended. When the parasite has encapsulated itself in the muscle, the treatment can only be symptomatic.

Myotonia (Thomsen's disease) is an affection characterized by a tonic cramp of muscles when the patient attempts to bring them into use. Usually the disease is hereditary, but there are acquired forms which are very similar. The cause is unknown, but the disease is seen in family groups and very rarely in isolated cases. It is more common in Germany and Scandinavia than in England and this country. It is not known whether there is a defect in the innervation of the muscle or whether it is a primary disease of the muscles.

SYMPTOMS.—There are painless tonic spasms, which occur whenever the patient begins to use the muscles. Voluntary relaxation and contraction are slow, and there seems to be a stiffness of the muscles. After repeated use, the muscles become limber. Cold or nervousness increases the spasms. The electrical and mechanical reaction of the muscles is increased. They may undergo hypertrophy. The general health of the patient is below par. Mental deficiency is present in many cases. The disease is incurable, but apparently does not shorten life to any extent.

TREATMENT is futile, although Thomsen, who suffered from the disease himself, thought that active muscular exercise was of some help to him.

Myoclonia, or **paramyoclonus multiplex,** is a rare affection, occurring chiefly in adult males, characterized by clonic muscular contractions, principally in the muscles of the extremities. These contractions occur constantly or in spasms, and may follow fright, injury, or emotion. The spasms are usually bilateral, and occur at the rate of from 50 to 150 a minute. There are no sensory or psychical associated symptoms. At times the spasms are so pronounced that the body is tossed about so as to make it difficult for the patient to remain in bed. Between the attacks there is likely to be a general tremor. In sleep the spasms do not take place. The bodily strength is generally impaired. It is believed to be a pathological manifestation of degeneracy.

TREATMENT.—In addition to tonics and hydrotherapy, measures must be resorted to to quiet the spasms. Chloral and hyoscine are indicated to accomplish this purpose.

The Muscular Dystrophies

Progressive muscular dystrophy is a wasting of the muscles, frequently with a preceding hypertrophy, which is due to changes in the muscles themselves.

Ætiology.—We do not know the cause, but we have noticed that it has a tendency to develop in families, and that males are oftener affected than females. It usually begins before puberty, but occasionally develops as late as at twenty-five or even thirty years.

Symptoms.—The first signs of the disease are a certain clumsiness and awkwardness of motion developing in a child who previously seemed normal. We find certain muscles or groups of muscles enlarged, those of the calves most often. But also those of the extensors of the legs, the glutæi, the lumbar muscles, the deltoid, the triceps, and the infraspinatus are enlarged sometimes. Those of the neck, face, and forearm rarely suffer. There is a wasting of other muscles, particularly the lower portion of the pectorals and the latissimus dorsi. Loose shoulders are an early characteristic.

The attitude in standing is characteristic—legs far apart, shoulders thrown back, abdomen protruded, spine greatly curved. The method of getting up from the floor is pathognomonic. The hands are placed upon the knees, and the child "climbs up its legs." The gait is awkward—a sort of waddle. There is a striking contrast between the feeble appearance of the child and its powerful looking muscles. As the disease progresses the wasting advances. Later all signs of hypertrophy disappear and deformities may develop. There are no sensory symptoms. The knee jerk is normal. The reaction of degeneration is not obtained.

Varieties.—According to the age at which the disease develops, we observe the following varieties:

I. Those beginning in childhood.
  1. Hypertrophic form:
    a. With pseudohypertrophy, lipomatosis.
    b. With real hypertrophy.
  2. Atrophic form:
    a. Infantile form of Landouzy and Duchenne, in which the muscles of the face and shoulder girdle are involved.
    b. In which the face is not involved.
II. Cases occurring in youths and adults (juvenile form of Erb).

Pathology.—The disease process is confined to the muscles, the spinal cord and the peripheral nerves being normal. The muscle fibres hypertrophy; the muscles increase; the connective tissue increases; fat is deposited about the muscles. Later there is atrophy, and finally the muscles involved resemble fat tissue.

Diagnosis.—In cerebral atrophy the loss of power comes first. In central progressive muscular atrophy, usually occurring late in life, the process begins in the small muscles of the hand (where the dystrophies never start). Reaction of degeneration and fibrillary twitchings are present; in most cases the reflexes are increased and there is a spastic condition of the legs. There is no hereditary tendency. Death is usually due to some intercurrent malady.

Treatment does not seem to influence the disease. Exercise seems best. (See also Pædiatrics.)

THE TENDONS

Rupture.—Sudden violent and unusual muscular effort may completely or partially *rupture a tendon.* The ones most liable to rupture are those of the quadriceps extensor femoris, the long head of the biceps, the ligamentum patellæ, the triceps, and the tendo Achillis. Sometimes instead of a rupture there is a tearing away of the tendon at its insertion, including the periosteum, the fibrous capsule, and even a portion of the bone.

SYMPTOMS.—The patient has the sensation of something giving away with a sharp pain, followed by loss of function. There may be perceptible through the skin a decided furrow, corresponding to the gap between the torn ends of the tendon.

TREATMENT.—If there is a gap between the ends of the tendon, it is hardly likely that repair will take place without operation. If we think the rupture is not complete, we may immobilize the limb in the best position to relax the tendon, and approximate the torn parts. Usually operative procedures are necessary.

Wounds of tendons are important on account of the likelihood of introducing infection. The whole tendon may be divided. The treatment is surgical.

Lengthening and transplantation of tendons have been successfully done. In case of paralysis of a certain group of muscles, from anterior poliomyelitis, a tendon from one muscle has been attached and sutured to the periosteum at a point where it could help to do the work of a paralyzed muscle.

Dislocation of a tendon may result from extreme violence, particularly that of the long head of the biceps from the bicipital groove, or the peroneus brevis may be displaced forward, or the tibialis posticus displaced from behind the internal malleolus. If, after reposition and rest, it recurs, operative measures are necessary.

Tenosynovitis, or **thecitis,** or inflammation of the synovial sheaths of tendons, may be an acute or a chronic condition.

Acute non-suppurative tenosynovitis usually results from strains, sprains, or excessive unaccustomed use, and is found in persons suffering from chronic malarial poisoning or chronic circulatory disturbances. The tendons of the wrist and those just above the ankle are most often affected.

The SYMPTOMS are pain, particularly on moving the extremity in which the tendon lies, partial loss of function, and a peculiar dry crepitus upon motion.

TREATMENT.—Rest on a splint and counterirritation, vibratory massage, and hot air treatment.

Suppurative tenosynovitis results from an infection of a tendon sheath due to a penetrating wound or one which may be so insignificant as not to be noticed, or from the blood. This form frequently arises from the extension of a felon into a tendon sheath by direct continuity, and usually forms part of a more or less extensive phlegmon. For symptoms, there are redness, swelling, throbbing pain, and marked constitutional disturbance. The flexor tendons of the hands and feet are most frequently involved, and from the anatomical structures there is a serious tendency for the process to spread.

The TREATMENT must be surgical, and the sooner free drainage is established the better.

Chronic tenosynovitis, or **tuberculous tenosynovitis,** is characterized by swelling and induration in and around a tendon sheath, due to tuberculous granulation tissue. There may be irregular swellings, showing fluctuation, which contain a fluid with little whitish bodies resembling rice grains and called "rice bodies." Sometimes we may find the tubercle bacilli in the fluid. The places of predilection for tuberculous tenosynovitis are the wrist, the ankle, and the knee. It may follow a slight injury or infection from a tuberculous joint. The process advances slowly and rarely undergoes spontaneous cure. There is a tendency for it to become secondarily infectious, and for suppuration to take place. Even with considerable swelling, there is very little pain, and only a very slight impairment of function.

The TREATMENT is surgical.

Ganglia are small cysts which appear along the course of tendons, principally those of the radial side of the wrist and especially on its dorsal aspect. They are also found in the palm of the hand, on the flexor aspect of the fingers, on the dorsal aspect of the foot, and about the insertions of the hamstring muscles. The contents are colloid or jellylike. There is controversy in regard to their origin, but it is supposed that they arise from a degeneration of the tendon itself or a growth of the sheath, rather than from a hernia of the sheath.

The TREATMENT consists in breaking the cyst wall by means of a sudden sharp blow with a book or other hard object, scattering the contents, which are absorbed. Sometimes they recur, when excision is indicated.

Compound ganglion is another name for a tuberculous tenosynovitis.

Tumors of tendons, of primary origin or from extension from other parts, may be benign or malignant. Syphilitic growths may originate here. A small fibroma developing here may produce a very marked disability.

Ossification of tendons sometimes takes place at their insertions. It may be the result of constant irritation from a rheumatoid arthritis or from a callus following an injury to a contiguous bone.

The TREATMENT, if any is demanded, is surgical.

THE FASCIÆ

The fasciæ in different parts of the body may be injured or diseased. As the blood supply to this tissue is poor, gangrene may occur when disease sets in. Wounds and solution of continuity of fasciæ permit of hernia of muscle, and also open up regions where serious destruction from infection may occur.

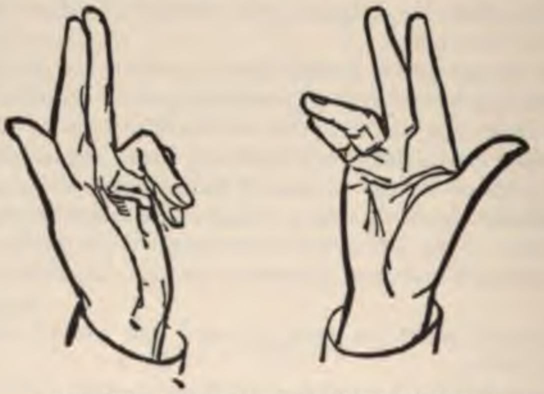

FIG. 177.—CONTRACTURE OF PALMAR FASCIA.

The TREATMENT is surgical.

Contractures of fasciæ, as a result of inflammation, traumatism, gout, or rheumatism, give rise to marked deformities. The fascia lata, the popliteal fasciæ, and the palmar fasciæ (Dupuytren's contracture) are most frequently involved.

The TREATMENT is surgical.

CHAPTER XXIII

OSSEOUS, MUSCULAR, AND ARTICULAR SYSTEM—*Continued*

ORTHOPÆDIC MEMORANDA (ὀρδός, straight; παιδίον, a child)

By C. H. Jaeger, M. D.

> *L'orthopédie, ou l'art de prévenir et de corriger dans les enfants les déformités du corps.—Andry, Paris, 1741.*

Synopsis: Wolff's Law.—Pott's Disease.—Torticollis.—Lateral Curvature of the Spine.—Rigid Spine.—Hip Disease.—Congenital Dislocation of the Hip.—Coxa Vara.—Knee Disease.—White Swelling.—Achillodynia.—Anterior Metatarsalgia.—Anterior Poliomyelitis.—Paralytic Club Foot.—Flat Foot.—Flat Foot of Children.

WOLFE'S LAW

In the normal state of health it has been found that the shaping of the parts of the body, and especially the bony system, is one of necessity and subsequent to the function expected from it. Julius Wolff, after many experiments and long research, has drawn the following conclusions: Any definite deviation in the relative position of a part of the human body to the whole will in time cause a static change in the inner architectural structure of the bone or bones entering into its support, this change advancing slowly until the new structure is mathematically and thereby functionally correct for the new position assumed. This inner change will in time also have an influence on the contour of the bone involved, thus altering its shape and making the same fit more readily its new relative position to the other parts, as well as its newly assumed function. In short, one may say that abnormal position of a part of the body demands a subsequent relative transformation in the inner structure, contour, and physiological function of the bones supporting this part.

POTT'S DISEASE

Occurrence.—A tuberculous inflammation of the bodies of the vertebræ or of the intervertebral cartilages. It occurs most frequently in children. Of 1,000 consecutive cases of Pott's disease treated at the Hospital for Ruptured and Crippled (recently analyzed by Waterman and Jaeger), 860 were under ten years of age; 600 under five years of age. Children with a tuberculous family history are more liable to the disease. It frequently develops after some infectious disease, such as scarlet fever, measles, or pertussis.

Traumatism is an ætiological factor in many cases.

Symptoms and Diagnosis.—The general symptoms are pain and reflex muscular spasm. The symptoms vary with the location of the disease.

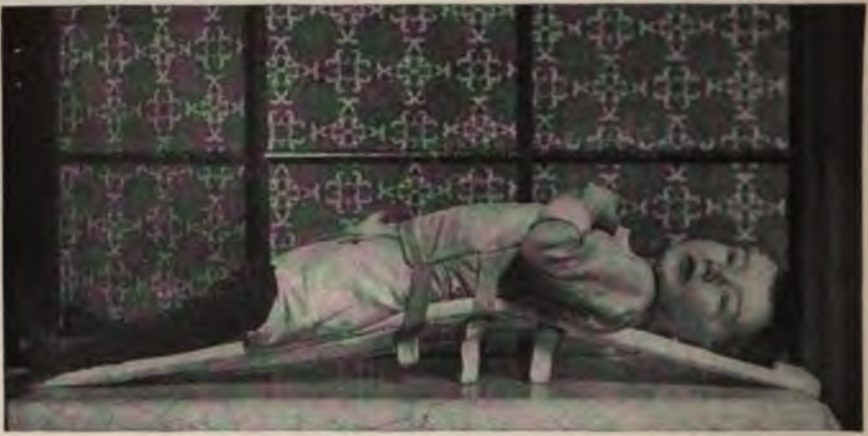

Fig. 178.—Bradford Carrying Frame for Pott's Disease.

In disease of the cervical region, the head is held stiffly. The muscular spasm may hold the head straight or incline it slightly to one side, thus simulating torticollis. The child may be seen supporting its head with its hands—*a valuable diagnostic symptom.* Interference with respiration caused by a postpharyngeal abscess may be the first symptom to call attention to the disease.

In disease of the dorsal region pain is often referred to the front of the chest. Grunting respiration and night cries are early symptoms, also an overcorrectness of posture or peculiar stiffness of the back, best seen when the child is asked to pick up something from the floor.

In lumbar disease the pain is referred to the lower part of the abdomen or down the legs; the child also assumes an overerect posture. There will be lordosis with consequent prominence of the abdomen, which may be the first noticeable sign of the disease. Spasmodic contractions of the legs are sometimes present.

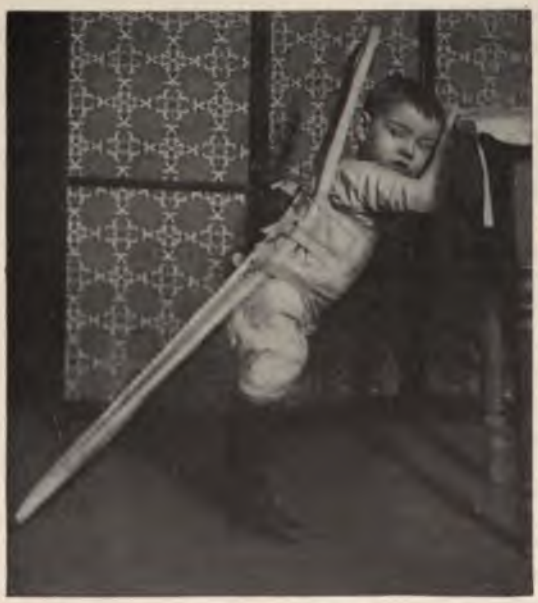

Fig. 179.—Bradford Frame.—Child able to Walk.

In all regions of the spine we find on examination *reflex spasm of all the spinal muscles*, causing rigidity of the spine on attempted motion in any direction. Angular deformity of the spine, or gibbus, is one of the later signs of the disease. Local tenderness may or may not be present. The patient walks with great care, instinctively trying to prevent jarring of the spine at each step.

Differential Diagnosis.—From the spinal curvature of rickets. One can usually find other symptoms of rickets. The curvature is usually rounded and involves the whole spine. It is not angular, as in Pott's disease. The deformity may be reduced by placing the child on the abdomen and overextending the thighs.

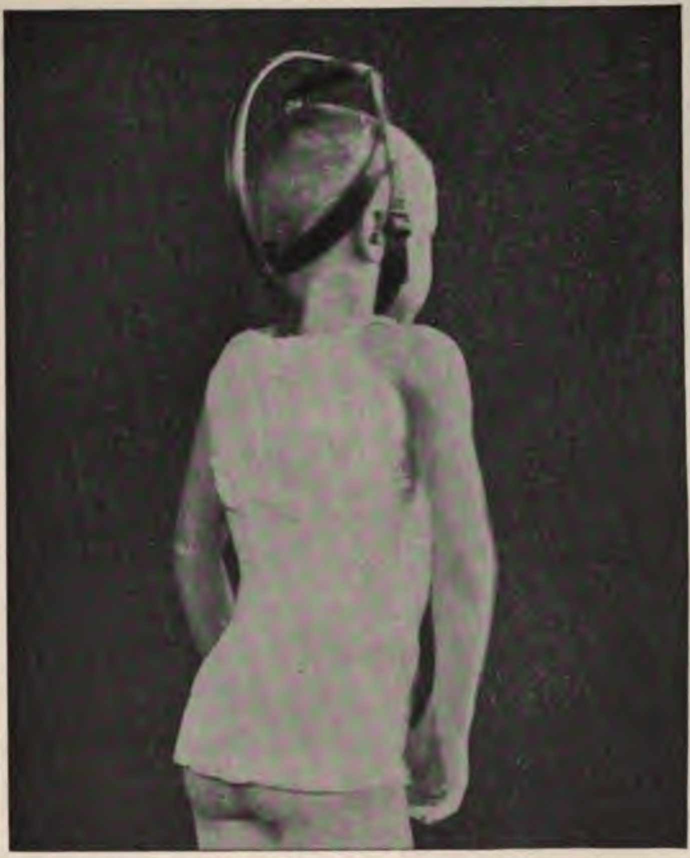

FIG. 180.—POTT'S DISEASE PLASTER JACKET AND HEADSPRING.

Wry Neck.—Sudden onset, restriction of motion due to contracted muscle. Motion free and painless in all other directions.

Hysterical Spine.—This usually occurs in neurotic adults. The spine is not rigid.

Typhoid and Syphilitic Spine.—The history of the case helps to distinguish it.

Strain of the Back.—History of injury and sudden onset.

Sciatica and Lumbago.—Rare in children. Pain restricted to the part affected. No spasm of spinal muscles.

Hip Disease.—Disease in the lower lumbar region, with psoas contraction and pain in the leg, simulates hip disease. Motion of the hip is not limited except in extension. An abscess may be mistaken for perinephritic abscess or appendicitis; other signs of spinal disease are absent. If about the saphenous opening, it may simulate hernia.

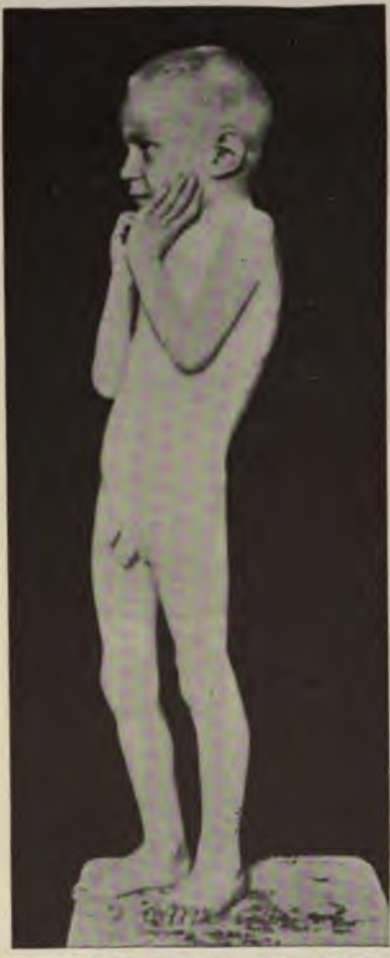

Fig. 181.—High Cervical Pott's Disease, showing Characteristic Posture of Child.

Therapeutics.—Let us take a typical case for an example: A young child, aged three, is brought for treatment soon after the onset of symptoms, with a very slight knuckle in the middorsal region. The first therapeutic measure would be *fixation in the horizontal position on a Bradford frame* (see illustration).

The dimensions of the frame, its width, and the distance between the shoulder joints (in other words a little narrower than the child's body—this is very important as it has direct bearing on the thoroughness of the fixation) are such that it extends about five inches above the head and eight inches below the feet. The material is half inch gas pipe, and between the borders is tightly stretched a canvas cover. At about the place where the child's glutæi will come, the canvas is covered with rubber cloth to prevent soiling. At the point where the deformity will rest, two narrow, thick pads of felt are sewed to the canvas in the central line, about one inch apart. These pads press upon either side and have a redressing influence upon the knuckle. The child is fixed upon the frame by means of a canvas apron strapped upon either side of the frame and extending from the upper part of the sternum to the lower part of the abdomen.

After some weeks the child has become accustomed to this position, and we increase our efforts at overextension of the spine by putting a sharp bend in the frame exactly where the gibbus is. The child is very easily taken care of in this frame. It can be carried about easily and taken out for an airing in a carriage, absolute fixation being secured without condemning the child to constant rest in bed.

The duration of this treatment is measured by the progress of the case. As the child grows better it becomes livelier and makes attempts at crawling with the frame. The case shown in Fig. 176 was under treatment for seven months, and then the patient began to walk, as shown in the illustration. Now we are ready for the treatment by the plaster of Paris jacket. The first jacket is put on very thin, and, before it is thoroughly dry, the child is replaced on the frame and pressed down upon it, in this way continuing the superextension. The child now wears the jacket and frame for two or three months. The frame is then removed, the jacket is replaced by a slightly heavier one, and the child is allowed to walk around. If the parents can afford it, a brace is applied at this time in place of the jacket. The most satisfactory brace is the Taylor brace as modified by Whitman, with acromial cups and shoulder pads. This brace or jacket is worn for one or more years. It is thus seen that in the most favorable case fixation treatment must be carried out for two years at least and possibly three, four, or five years.

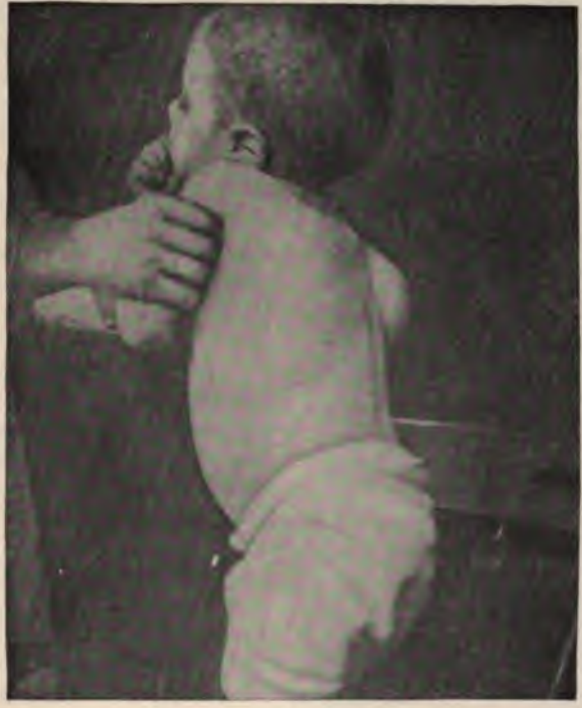

FIG. 182.—SPINAL TUBERCULOUS ABSCESS.

Should the disease be above the seventh dorsal vertebra, the child must wear a headspring or chin piece, as the jacket or brace alone will not give sufficient support in disease above the mid-dorsal region. The frame treatment cannot be applied to children above four years of age; in place of it a brace or jacket is applied at once.

A little device employed by Lorenz, called "scratch band," adds greatly to the comfort of those obliged to wear a plaster of Paris jacket. This is made by placing a strip of strong China silk, about 8 inches wide and 1 yard long, so that it will project from each end of the jacket under the shirt, before applying the jacket. This piece of silk is sewed up and down and around, every part of the torso coming in for its share of "scratching." The **treatment** of adult patients with Pott's disease is similar to the later stage of the child's treatment. A brace or plaster of Paris jacket is applied.

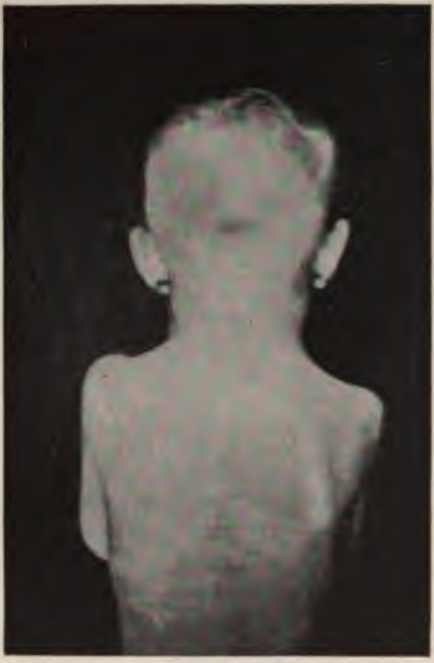
FIG. 183.—CERVICAL POTT'S DISEASE, SHOWING CHARACTERISTIC BROADENING OF NECK.

The forcible reduction of the deformity of spinal disease, as advocated by Calot, has been abandoned as unscientific and entailing too great a risk for the patient, besides giving no permanent benefit. New bone will not form where the tuberculous process has once eaten it away.

GENERAL HYGIENIC TREATMENT is of great importance in the management of these cases. Plenty of good food, outdoor life in the fresh air as much as possible, tonic medicines, everything that will increase the bodily welfare, will arrest the progress and hasten the cure of the disease.

COMPLICATIONS.—Abscesses, as a rule, are treated conservatively. Experience has not demonstrated the value of opening and draining. Aspiration of the abscess contents and injections of medicines, such as iodoform and glycerine, are successfully employed. This does not apply, however, to abscesses occurring in connection with cervical disease. These are usually postpharyngeal, and they point in the pharynx, interfere with respiration, and, if left to break spontaneously, may suddenly burst and discharge their contents into the larynx. Here an incision is called for. This is best done from the outside. The incision is made along the posterior border and upper part of the sternocleidomastoid muscle.

In lumbar disease, where abscesses are more frequent, we find them opening at the femoral ring. Psoas abscesses are sometimes aspirated with advantage, especially when they cause discomfort and deformity. Paralysis occurs in from 5 to 6 per cent of the cases. The best treatment is by fixation of the spine, and it is best accomplished by rest in the horizontal position on a Bradford frame. If the disease is high up, traction directly on the head with the weight and pulley is indicated.

Spasmodic contraction of the limbs, which is painful and which so frequently accompanies paraplegia, is *best treated by weight and pulley traction on the limbs or a fixation brace.*

Potassium iodide should be given internally in gradually increasing doses. Massage is of value during the stage of recovery from paralysis; it is contraindicated during the presence of spasm.

TORTICOLLIS

Torticollis is an abnormal holding of the head, either constant or intermittent, toward one shoulder while the chin points toward the opposite side and upward. There are two varieties, *congenital* and *acquired.*

The *congenital* form is rare and is caused by the head being held in a faulty position in utero or by injuries at birth during a difficult labor. Of the acquired, there are several forms. In the *acute* (*rheumatic*) form the history is one of exposure and catching cold, suddenly followed by pain and contraction of one side of the neck. The spastic is the most common form. It is produced by anything causing an irritation of the spinal accessory nerve along its course or at its origin. Among these are burns, enlarged cervical lymph glands, quinsy, retropharyngeal abscess, tumors pressing on the spinal accessory, and infectious diseases. In the *malarial* form we may find at regular intervals in each year an acute spastic contraction of the muscles.

Symptomatic.—In cervical Pott's disease torticollis is often the first symptom. Then come hysteria, especially in women, and chorea.

The **differential diagnosis** is easily made from Pott's disease by the character of the deflection of the head, the absence of pain, and the freedom of motion in other directions.

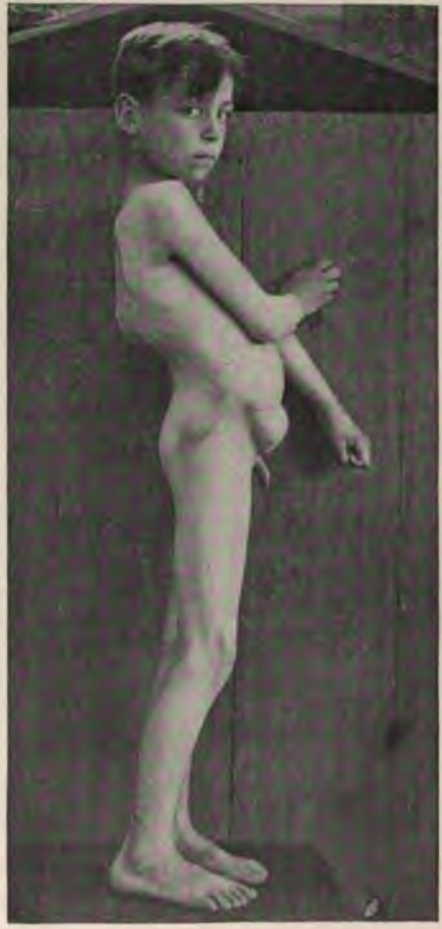

FIG. 184.—POTT'S DISEASE, SHOWING KYPHOS AND ABSCESS. (Hospital for Ruptured and Crippled, N. Y.)

Symptoms.—The characteristic picture of the chronic type is that the head lies to a great extent over the thoracic half of the healthy side, being drawn toward the side of the contracted muscle, whereas the face is drawn to the opposite side and the chin points upward. By measurement one finds one sternocleidomastoid muscle shorter than the other. On palpation the muscle is tense. By active movement of the healthy side it is possible to bring the face over the shoulder. Capability of movement of the head to the affected side is only very slight actively, and only to a small degree passively. There is usually asymmetry of the face. In acute cases we find local pain and tenderness, with great sensitiveness on an attempt to correct the deformity.

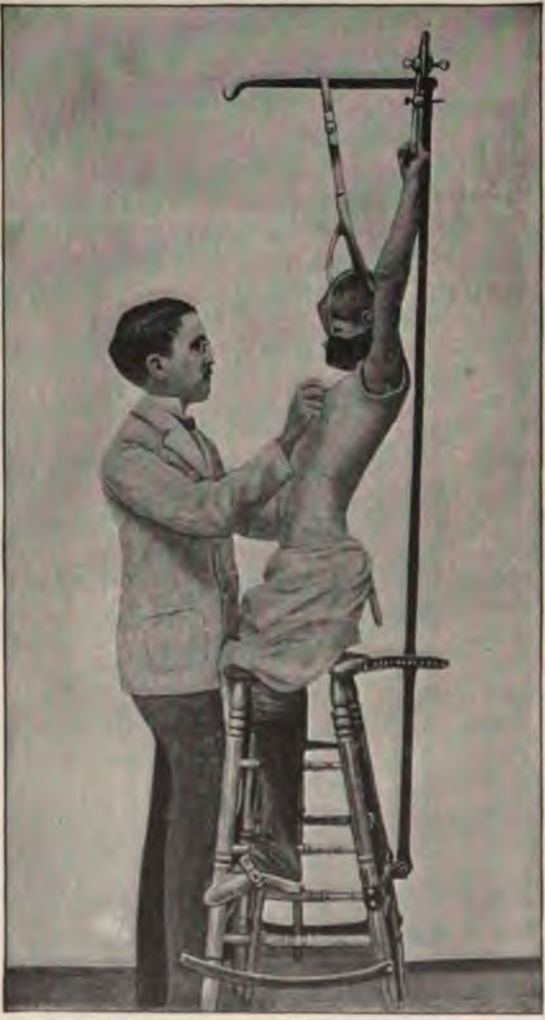

FIG. 185.—APPLYING PLASTER OF PARIS JACKET. (Taylor, the Medical News.)

Treatment.—In mild cases regular manipulation and stretching of the contracted muscles and tissues, combined with massage and vibratory massage, will bring about a cure.

In the *acute form, with pain and spasm,* counter-irritation and some form of support to hold the head in proper position are indicated. The simplest is a collar composed of cotton, a couple of roller bandages tightly wound about the neck and reenforced with adhesive plaster.

It is rarely necessary to apply a plaster of Paris jacket, with which is incorporated the jury mast. In the *chronic stage,* or *stage of simple deformity,* one must resort to tenotomy, either subcutaneous or open, of the contracted muscles and the application of a plaster of Paris dressing inclosing the head and shoulders, the head being forcibly overcorrected. This dressing should remain for from six to eight weeks and be followed by massage and gymnastic exercises to prevent recurrence.

LATERAL CURVATURE OF THE SPINE

This is an habitual deviation of some part of the spinal column from the normal median line.

Ætiology.—Heredity is a factor in the ætiology. The tendency to weakness of the muscles, which favors deformity, is inherited. Occupations which demand or favor a faulty position of the trunk are indirect causes. In school children the practice of carrying heavy books with one arm and a faulty position while sitting at the desk, combined with confinement and lack of exercise, favor the production of the deformity. The direct cause is the force of gravity acting on the weakened spine. It is much more common in girls than in boys; the proportion is four to one (Whitman). It is a condition of early adolescent life.

Diagnosis.—Very frequently the parents' attention is first drawn to the condition by noticing one shoulder higher than the other or one hip more prominent. The diagnosis is readily made by examining the nude back, when the deviation is seen. The rotation of the vertebræ which usually accompanies the lateral curve is best seen by having the patient stand before one, facing the windows and bending the body forward, the arms and head hanging down.

There are two curves—a primary and a secondary, or compensatory, curve, giving the spine the shape of the letter S or an inverted S. The dorsal region is most frequently the seat of the primary curve, and the curve is most frequently to the right.

Pain is very rarely a symptom in the younger patients, being usually found only in adults and in cases with very marked deformity. In these cases there may be present symptoms due to pressure on internal organs, such as the heart, lungs, or liver.

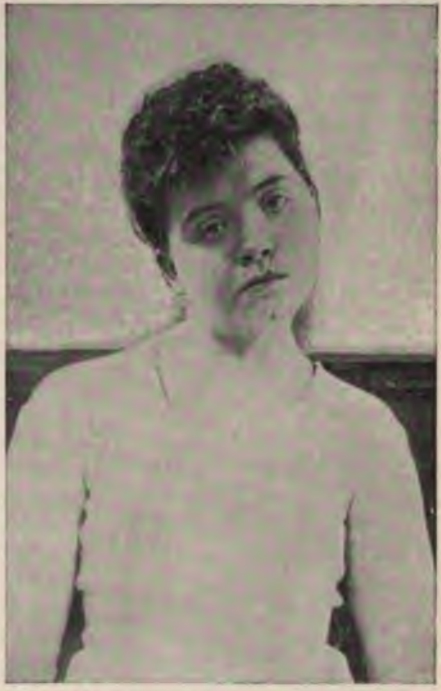
Fig. 186.—Torticollis showing Facial Asymmetry.

The varieties are the habitual (the most frequent), the rhachitic, the static, the congenital, the cicatricial, the empyemic, the nervous, the traumatic, the rheumatic, the neuromuscular, and the sciatic. Rhachitic deformity of the spine usually takes the form of a posterior curve, but in rare cases we observe a lateral curve. The principal differences are that it is seen at an earlier age, and shows usually one long curve, and that there are other evidences of rickets present.

The static form is due to difference in the length of the legs, which causes an inclination of the pelvis toward the short leg and consequent curve of the lumbar vertebræ. A large number of patients with lateral curvature have a difference in the length of their legs. The cicatricial, empyemic, ischiadic, traumatic, and rheumatic forms are secondary to the primary disease or injury.

The congenital form is rather rare, but it does occur.

Hysterical scoliosis is seen in nervous patients who present other signs of hysteria. It disappears under narcosis.

The paralytic form occurs after anterior poliomyelitis, cerebral paralysis, progressive muscular atrophy, and other nervous diseases. This presents usually only one long curve, which rarely becomes fixed.

Treatment.—Massage of the muscles of the back and appropriate exercises to strengthen them. By placing the child in a proper attitude and by its frequently practising to assume this attitude, it will gradually retain it. Two or three exercises that have a redressing influence upon the curvature may be taught the child, with instructions to practise them daily. Two exercises well carried out are better than a dozen poorly executed. 1. Have the patient stand straight, with the heels together and the toes apart, and take a deep breath. 2. The patient places one foot (the foot on the same side as the convexity of the dorsal curve) slightly forward and outward, and then bends the knee; this reduces the lumbar curve. He now places one hand on the highest point of the deformity and the other hand on the back of the neck (see illustration), and pulls and presses to reduce the dorsal curve. The two motions are done in unison. First command: To bend the knee and press on the hump. Second command: To straighten the knee and relax the pressure on the hump. Another exercise: The patient standing straight, with the heels together and the knees extended, one arm (the one corresponding to the side of the concave dorsal curve) is raised straight up and held close to the ear, and the other arm is raised to the horizontal position; the patient now, without bending the knees, bends the body slowly forward and back again. Another exercise: The patient, lying face down on a couch, places both hands behind the neck and, an attendant holding the feet down, the patient raises the

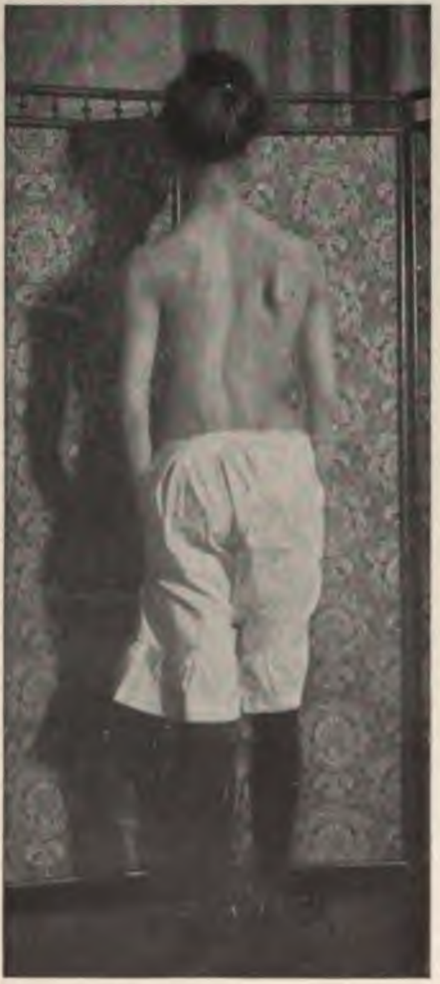

FIG. 187.—SCOLIOSIS.

trunk upward (or up from the couch). This is repeated from ten to twenty-five times.

The more severe cases, especially in adults, are often accompanied by pain. It is then necessary to provide a brace or plaster of Paris corset. The principle of the treatment is to mobilize the spinal column first, then to reduce deformity as much as possible by strengthening the muscles and training the patient to hold the body in this corrected position.

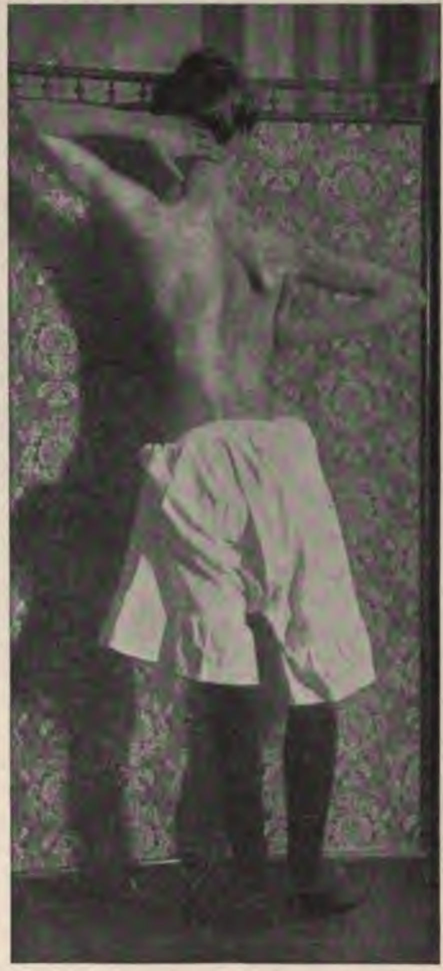

FIG. 188.—EXERCISE FOR SCOLIOSIS.

RIGID SPINE; SPONDYLITIS DEFORMANS (SPONDYLOSE RHIZOMÉLIQUE)

This is a chronic ankylosing inflammation of the spine characterized by local pain, stiffness, and deformity. The pathological features are atrophy of the intervertebral discs and periosteal proliferations and thickenings with ossification, particularly on the anterior and lateral aspects of the spine. On account of these bony proliferations firm bony unions—synostoses—form between the vertebræ and they extend gradually to the whole spine. Together with these bony changes we observe atrophy of the muscles and a gradual forward bending of the spine. As ætiological factors may be considered trauma, the continued carrying of heavy burdens, and infectious joint inflammations, such as gonorrhœal arthritis and polyarticular rheumatism.

Schlesinger has described a form of ossifying spondylitis which he considers to be due to a local disease of the intervertebral ligaments, the development of which is most probably favored by a congenital disposition to excesses in bony growth.

Symptoms.—The symptoms are pain of a rheumatic character, pain in the loins and radiating forward, a diminishing mobility of the spine ending in absolute stiffness, and a marked forward bending of the entire spine.

Neuralgias occur, probably from bony encroachments on the nerve roots.

Treatment.—The application of a brace or plaster of Paris corset, massage to the back, and the cautery at regular intervals. In the early stages, rubber heels and self-suspension add greatly to the comfort. Regulate the diet (antirheumatic) and order general outdoor exercise and tonics.

HIP DISEASE

This is a tuberculous disease of the joint structures of the hip, usually beginning at the femoral head, less frequently in the acetabulum and synovial membrane. The causes are predisposing and exciting. Among the first are reduced vitality, as after infectious diseases, injury, and a family history of tuberculosis. The exciting cause is the presence of the tubercle bacillus. It is most common in early life and more frequent among boys than girls.

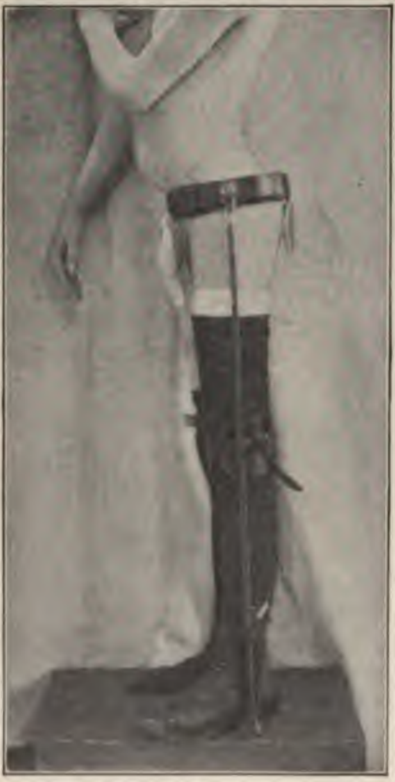

FIG. 189.—HIP SPLINT.
(Hospital for Ruptured and Crippled.)

Diagnosis.—As in tuberculous disease in other joints, an early diagnosis is very important. The early symptoms are fatigue in the affected leg on slight exertion and a limp. Pain is rarely complained of in the early stage, and when it is present it is usually referred to the knee. If the disease is progressing rapidly, there are night cries; the child screams suddenly during profound sleep, wakes for a few minutes, and then falls asleep again. The night cries are due to a sudden movement of the hip, causing an involuntary contraction of the hip muscles and thus producing pressure on the inflamed parts. Lameness in the beginning of the disease is not a constant symptom, being present for some days and absent again. The patient walks by stepping on the ball of the foot rather than on the heel; the knee and hip are held slightly flexed and the thigh slightly adducted. There is usually some stiffness in the morning, which, together with the limp, passes away toward evening. A physical sign observed on examination is stiffness due to reflex spasm of the muscles which contract and hold the hip joint when motion is attempted beyond a certain point.

Malpositions of the Limb.—Adduction and flexion are caused by muscular spasm and become permanent by the changes in the joint and contractures of the surrounding soft parts. Outward rotation also occurs in the early stage. As the disease progresses, the flexion becomes greater and the limb becomes adducted and rotated inward. Atrophy becomes manifest early in the history of the disease. It is caused partly by disease and reflexly through the nervous irritation of the joint disease.

Shortening is of two kinds, real and apparent. The real shortening is the result of destruction of the bony parts entering into the joint structure, with consequent upward displacement, and secondly to the atrophy. Apparent shortening is due to the malposition of the limb.

Abscess is present in a large proportion of cases, particularly in those cases which have had inefficient treatment or none at all. Its usual site is upon the upper and outer aspect of the thigh.

Differential Diagnosis.—Pott's disease, low lumbar disease with psoas contraction, simulates hip disease, but may be excluded when the range of motion is limited in all directions. In Pott's disease motion is restricted only in the line of extension by the contracted ilio-psoas muscle. In coxa vara the trochanter is above Nélaton's line; motion is not painful and is restricted only in abduction. Sprains and acute synovitis are excluded by their sudden onset and the history of injury. In congenital dislocation of hip the patient has a limp, characteristic of dislocation. There is no pain, and motion is free in all directions.

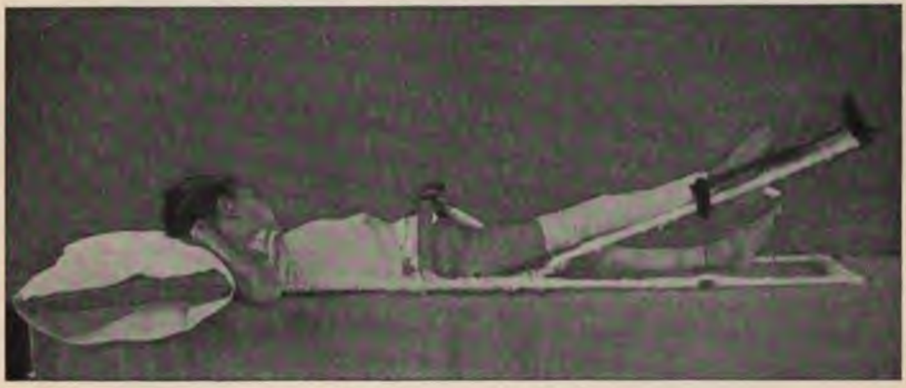

Fig. 190.—Bed Extension in Hip Disease.

Treatment.—The cardinal point in the management is, as in other tuberculous joint affections, that of rest and fixation. Constitutional treatment is an important adjunct to the mechanical. It is important to *reduce any deformity that may exist before applying fixation treatment.* This may be accomplished by traction applied by the weight and pulley (see illustration) while the patient is in bed. Or the reduction may be gradually attained by successive plaster of Paris dressings, the leg being put in the best possible position at each sitting. Or forcible reduction may be done under narcosis and a plaster of Paris spica applied to maintain the corrected position.

The leg being in good position, some form of retentive apparatus is now applied. The best brace is the one designed by Hessing. It insures absolute fixation of and protection to the hip joint, besides permitting free motion of the knee and ankle joints, thus obviating to a certain extent the evil after effects of total fixation, namely, muscular atrophy from disease and shortening from interference with the circulation of the limb. It is worn under the clothes and is hardly noticeable. It consists of a pelvic portion, which is carefully moulded upon the pelvis, holding it perfectly rigid; to this is attached the leg portion, or so called shell splint. The leather shells are jointed on the inner and outer sides by two light steel splints, and are laced about the thigh, leg, and foot. The steels have free joints at the knee and ankle. At the upper and inner part of the thigh the shell has a broad padded surface upon which the ischium rests, and a lacing passes around the ankle to produce extension. It is not necessary to wear a high shoe on the foot of the sound side.

A very efficient brace is the so called traction hip splint. It consists of a pelvic band made of a short steel about an inch and a quarter wide and an eighth of an inch thick and bent to a U shape. This is made long enough to go three quarters of the way around the pelvis. To this is attached a long steel bar which extends down the leg and about two inches and a half below the foot.

The pelvic band is strapped around the body and serves as a support for two perineal straps and also for an upright bar, about five inches long, to which is attached a similar band which encircles the thorax. This latter insures better fixation and lessened danger from flexion deformity at the hip. The leg stem is provided with a strap at the knee joint for holding the leg firmly to the brace. The patient wears on each side of the leg adhesive plasters (best made of mole skin). They extend to an inch above the malleoli and are provided at the lower ends with buckles. Two straps attached to the foot piece of the brace and inserted into the buckles produce traction on the leg.

A high shoe (cork sole) is worn on the healthy side. For adult cases and for mild types of cases in children, the Lorenz spica is a convenient and simple retentive apparatus. The spica is modelled very accurately around the pelvic bones, thus getting a firm and steady hold. Extending only to the knee, it allows of freedom of motion of all the joints except the diseased hip. Often it is found useful to combine a light plaster spica with the long traction splint, if the joint is very sensitive and the patient does not seem to progress favorably.

The duration of the treatment is in the most favorable case two years and may be from three to seven years. The child should remain under the observation of the physician for a considerable period after an apparent cure.

When the active symptoms, pain and muscular spasm, subside, and the disease is apparently cured, we apply a convalescent hip brace. This is the ordinary traction splint with the thoracic band removed and about two inches of its lower end cut off and fastened to the heel of the shoe. When the brace is applied, the patient's heel should not quite touch the bottom of the shoe, thus protecting the hip joint.

As the patient progresses the brace is removed at night and then for short periods during the day, gradually weaning the patient from its use.

TREATMENT OF COMPLICATIONS.—Abscesses are treated expectantly. Even large abscesses may be absorbed. If they are very large and painful and show a tendency to rupture spontaneously, it is best to empty the abscess by aspiration, or one may incise under the strictest aseptic precautions, making a free incision, curetting out the abscess wall, and sewing up the wound completely. Primary union frequently follows this procedure. In cases with long continued suppuration a more radical treatment may be indicated and then we do an excision of the hip joint.

CONGENITAL DISLOCATION OF THE HIP

This is more frequent than congenital dislocation of any other joint.

Ætiology.—It is most common in females, occurring in them in about 85 per cent of the cases. One side is affected more frequently than both (about 70 per cent of the former and 30 per cent of the latter). Defective development of the acetabulum and abnormal laxity of the capsule are predisposing causes. The dislocation is usually dorsal, but in rare cases it is anterior, the head being under the anterior superior spine of the ilium.

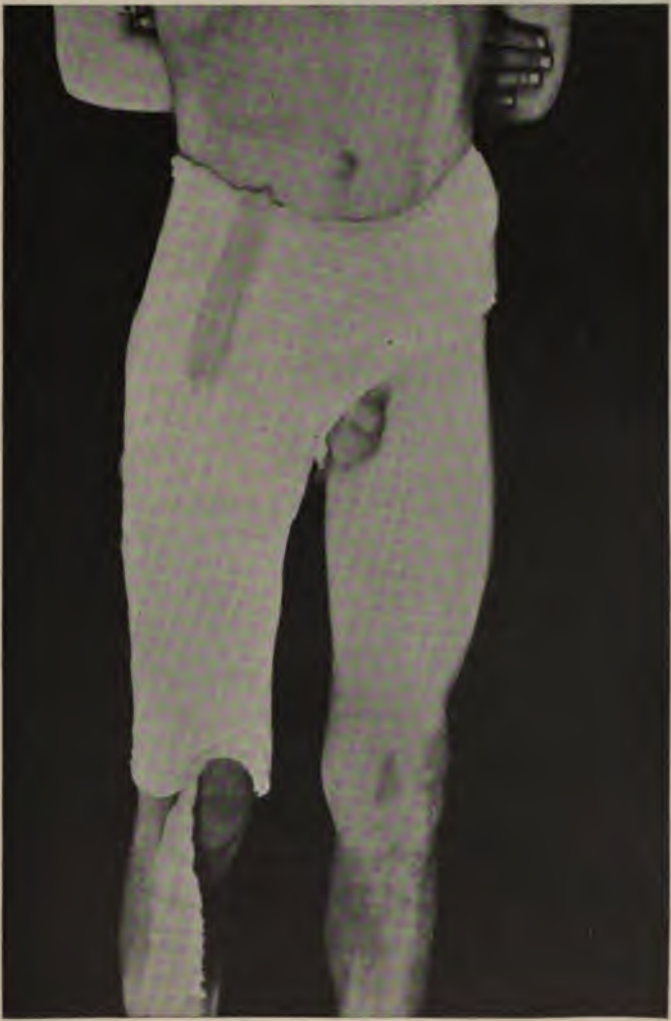

FIG. 191.—LORENZ SPICA.

Symptoms.—The condition is usually first recognized when the child begins to walk. If only one hip is dislocated, there is a peculiar limp; at each step the body is thrown toward the affected side, a sort of lunge forward and sideways. The affected leg is shorter than the other and becomes shorter (the femoral head sliding upward) at each step. The trochanter is above Nélaton's line. As to the subjective symptoms, the child tires easily and as it grows older has pain on exertion. There is disinclination to walk. The parents may notice a lump on the buttock, which is the displaced head of the femur. In bilateral dislocation the patients walk with a peculiar ducklike waddle, the body lunging from one side to the other at each step. The disability in these cases is more marked. There is also a marked prominence of the buttocks and there is lumbar lordosis.

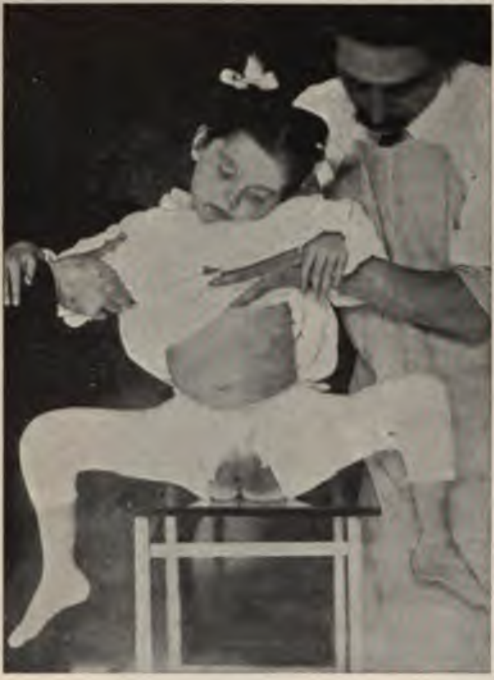

FIG. 192.—DOUBLE SPICA AFTER REDUCTION OF DOUBLE CONGENITAL DISLOCATION OF HIP (Lorenz).

The **diagnosis** is easily made. A physical examination reveals the head of the femur in an abnormal place. There is no pain or spasm on motion, which is free in all directions, and the condition cannot possibly be mistaken for tuberculous disease of the hip joint. Coxa vara, although in this condition the trochanter is above Nélaton's line, is excluded by finding the head of the bone in its proper place and by the limitation of motion in the direction of abduction.

Treatment.—The work of Lorenz and Hoffa has resulted in a marked change of opinion on this subject, and we are able to give a good prognosis for cure when formerly nothing could be done for these cases. *Bloodless reduction*, or the *Lorenz method*, consists in reducing the dislocation under ether and holding the limb in position by means of a plaster of Paris cast until the stretched capsule and soft parts have contracted and the head has secured a firm hold in its normal position.

The details are as follows: Under ether the resistance of the soft parts (the adductor and extensor muscles) is first diminished; this is done by forcibly abducting the leg in an intermittent manner, and with the ulnar border of hand forcibly massaging the adductor muscles at their insertion into the pelvis. The leg is now pulled upon to bring the head of the femur to the level of the acetabulum, an assistant applying countertraction at the perinæum by means of the hand or a sheet passed under the perinæum and having the two ends tied to the head end of the table. Traction is now intermittently applied until the soft parts are relaxed. The reduction manœuvre proper is now carried out. The leg is grasped with one hand above the knee, and flexed, rotated outward, and abducted. Motions like those of a pump handle, but in the horizontal direction, are now carried out, and while the leg is held in the aforesaid position of flexion, rotation outward, and abduction, the knee is gradually brought behind the plane of the body (superextension). The other hand is placed in the groin, the thumb upon the trochanter, the fingers next to the genitals, and pressure inward is exerted upon the trochanter. In older children the surgeon's fist or a padded wedge may be used as a fulcrum upon which the trochanter rests; the head of the bone is then forced over the edge of the acetabulum. These manœuvres having been properly and consistently carried out, the head will pop into the acetabulum with an audible snap.

The next important part of the treatment consists in retaining the head in its desired position, Lorenz's theory regarding the success of the treatment being that the constant impaction of the femoral head in the acetabulum while walking will cause a deepening of the usually shallow structure and give a firm hold to the joint. It will be noticed that while the limb is abducted the head remains in place, and when the leg is adducted the dislocation recurs; consequently we apply a plaster of Paris dressing in the position strong enough to assure a firm hold in the acetabulum; this Lorenz calls the indifferent middle position. The original dressing is retained for from three to six months, depending largely upon the cleanliness. It is then removed, and the leg is very cautiously adducted a little in order to make locomotion easier and to insure the stability of the joint in the straightest position, and another dressing is applied. This is worn for two or three months. A cork sole is applied to the shoe of the side that has been operated on, in order to even out the difference in the length of the legs. A third spica

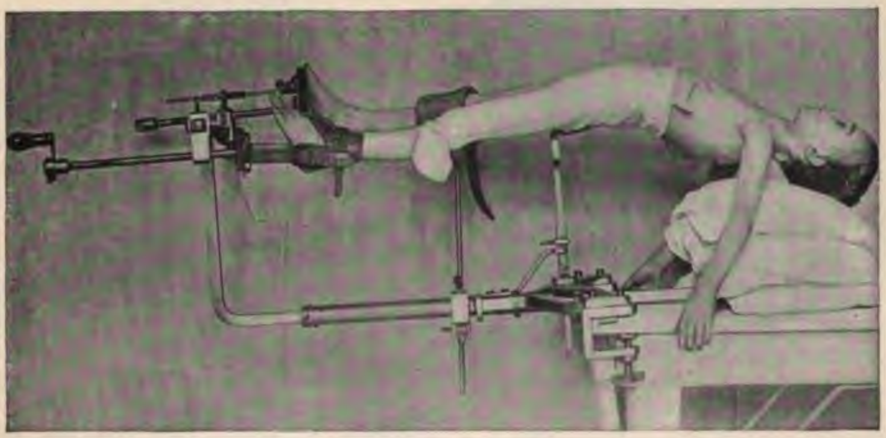

FIG. 193.—LORENZ HIP REDRESSEUR.

may be applied with the leg in a straight position and retained for two or three months.

The operation is not absolutely free from risk, for by too forcible manipulation there may occur a fracture of the neck of the femur or of the ramus of the pubes, paralysis of the sciatic and crural nerves, and other injuries of the soft parts. In bilateral cases both sides may be operated upon at one sitting.

The most favorable age at which to perform the operation is under six years, although in unilateral cases patients have been operated upon successfully as late as ten years of age, while eight is about the limit in bilateral cases.

The *bloody method* consists in deepening the acetabulum and then replacing the head. The operation may be performed after the bloodless one has been tried without success. Lack of success is often due to distortions of the head and neck of the femur, and it is often necessary to do a subsequent osteotomy at the upper end of the femur, causing the bone to heal in as good a position as possible.

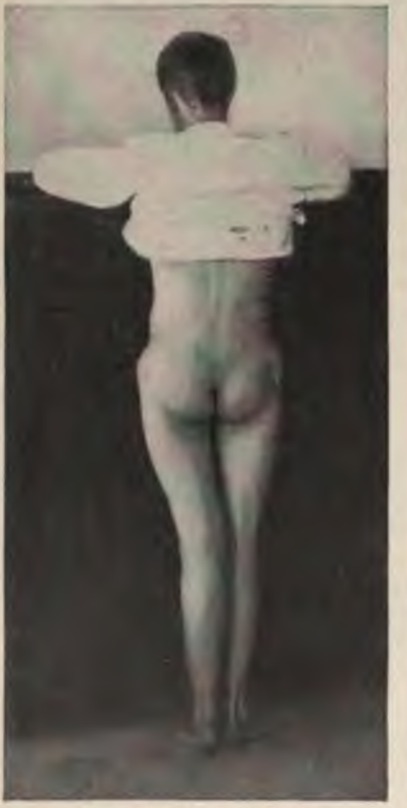

FIG. 194.—COXA VARA. Showing elevation of trochanters.

COXA VARA

This consists in bending of the neck of the femur, usually in a downward and backward direction. It is a deformity analogous to knock knee or bow leg. It occurs in late childhood and adolescence. It is more often unilateral than bilateral.

Ætiology.—"It is one of a group of static deformities caused by a disproportion between the strength of the supporting structure and the burden that is put upon it" (Whitman).

Fracture of the neck of the femur in childhood is often followed in later years by coxa vara. Males are affected three times as frequently as females. Rhachitis is an ætiological factor.

Symptoms.—Pain or discomfort in the hip joint and thigh, especially after overexertion, with a limp. There is shortening of the affected limb amounting to an inch or more; this is due to the change in the angle of the neck to the femur, the trochanter being an inch or more above Nélaton's line. Limitation of motion in the direction of abduction, inward rotation, and flexion.

In bilateral coxa vara the symptoms are more pronounced, the abduction of both thighs obliging the patient to sway the body from side to side at each step, as in knock knee, to permit the legs to pass—the so called scissors walk. In extreme deformity the limbs are actually crossed.

The symptoms last a varying period, from one to three or more years, and usually end when the bones are completely ossified.

Diagnosis.—From hip disease, by the absence of severe pain and muscular spasm; by motion not being limited in all directions; by shortening and elevation of the trochanter above Nélaton's line, which is present very early in this affection, coming later, with the destruction of bone, in hip disease. From congenital dislocation, by our not being able to feel the femoral head out of its normal position and by limitation of motion, which is free in dislocation of the hip. Coxa vara is not present at birth.

Treatment.—Constitutional treatment is important in the early stages, with attention to diet, gymnastic exercises, massage, and avoidance of overstrain. A brace should be worn to take the weight off the disabled limb; a form of brace similar to the convalescent hip splint, which may have a joint at the knee, is very useful. This should be worn for a year or more.

An *operation is indicated* when great deformity exists. A linear osteotomy just below the trochanter minor is performed and the limb rotated inward and abducted. A plaster of Paris spica is now applied, or a cuneiform osteotomy at the upper end of the shaft, with a view to restoring the proper angle to the neck of the shaft, is indicated in young patients.

KNEE DISEASE (WHITE SWELLING)

Tuberculous inflammation of the structures of the knee joint. It is an osteitis of the epiphysis beginning in either femoral or tibial epiphysis, less frequently in the synovial membranes. Another variety begins as a simple synovitis, the early symptoms of which are subacute, the condition becoming chronic, with thickening and infiltration of the sac.

The **symptoms** are those common to other tuberculous joints, namely, joint tenderness, muscular spasm, deformity, and in addition distention of the joint, heat, and swelling. Atrophy of the muscles comes on later in the course of the disease. There are pain and local sensitiveness. Shortening is not present at first; on the contrary, there is usually lengthening of the leg, due to hyperæmia and increased growth at the epiphysis. This increased growth, however, gives place to atrophy after the disease is cured, and almost all the patients recover with a shortened limb.

Frequently the inner condyle enlarges to a greater extent than the outer, thus causing knock knee. The pain is rarely severe, and night cries are not a common feature of the disease. If the condition is progressing rapidly or if there is an acute exacerbation or if the patient receives a fresh injury, the joint will be painful. Muscular fixation is a prominent symptom, the joint being fixed in slight flexion. Malpositions of the limb are flexion, rotation outward of the tibia on the femur, and subluxation of the tibia backward.

The synovial variety of the disease is found usually in adults, and it begins as a simple subacute synovitis. The condition goes on for years without marked symptoms, but there will be a thickening of the synovial capsule, very slight limitation of motion, a gradual thickening of the bones, and occasional attacks of pain.

Differential Diagnosis.—In rheumatism, usually more than one joint is affected, and the onset is sudden and accompanied by constitutional symptoms. A sprain has a sudden onset, with a history of injury and rapid recovery. In *Charcot's disease* there is the presence of tabes dorsalis, with sudden effusion into the knee and rapid destruction of the joint. The *hysterical joint* occurs in a neurotic patient, and there is absence of physical signs.

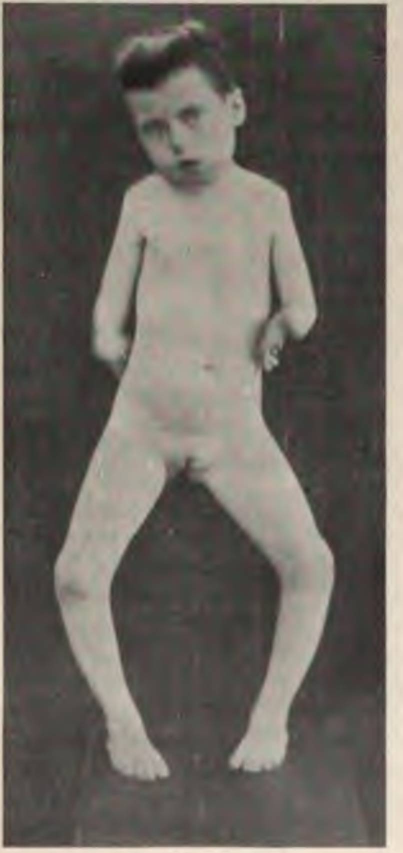

FIG. 195.—BOW LEGS AND CONGENITAL DEFORMITY OF UPPER EXTREMITY.

In *sarcoma* the disease extends rapidly and is not influenced by treatment. The x rays are of great value in the distinction.

Treatment.—In childhood the treatment is conservative, because the prognosis is favorable as to cure of the disease and as to functional use. Moreover, an operation which would destroy the epiphysis would prevent further growth of the leg and cause great deformity by shortening in later years. In adults, where it is desirable to bring about a cure as quickly as possible and where, on account of full development, excessive shortening of the limb is not to be feared, excision of the joint with ankylosis is most advisable.

If any deformity exists, this must first be corrected, so that when healing takes place the leg will be in good position, namely, that of extension. The flexion deformity may be corrected by rest in bed and traction applied to the leg. Or one may apply a plaster of Paris bandage, with an assistant making strong traction on the leg during the application of the bandage. It may be necessary to give an anæsthetic. The leg being straight, a well fitting brace is now applied to take the weight of the body from the diseased knee. The Thomas brace fulfils all the demands for utility and simplicity. It consists of an iron ring irregularly ovoid in shape, in order to fit the thigh snugly at the perinæum, to which ring are fastened two upright bars which go down each side of the leg and extend two or three inches below the foot, where they are joined. The circular leather bands support the leg at the thigh and calf and the knee is still further fixed by being bandaged snugly to the brace. A high shoe, cork sole, or patten is worn on the sound foot.

It is customary to increase the usefulness of the Thomas brace by combining traction by means of adhesive plaster applied to the leg up to the knee joint, terminating in straps which are buckled to the foot piece of the brace. If the symptoms are very acute, crutches may be used in addition to the brace, and a very light plaster of Paris cast be applied to the knee before putting on the brace.

While acute symptoms are present, the brace is worn night and day; after a number of months, when the acute symptoms have subsided, i. e., the muscular spasm and pain, etc., the brace may be left off at night, carefully watching the patient for recurrence. As the patient improves the brace may be removed for a few hours each day. The caliper brace may now be substituted; the two bars are cut off, turned inward at a right angle, and fastened to the heels of the shoes. The bars are made a little longer than the leg, so that the heel does not touch the bottom of the shoe when the patient is walking.

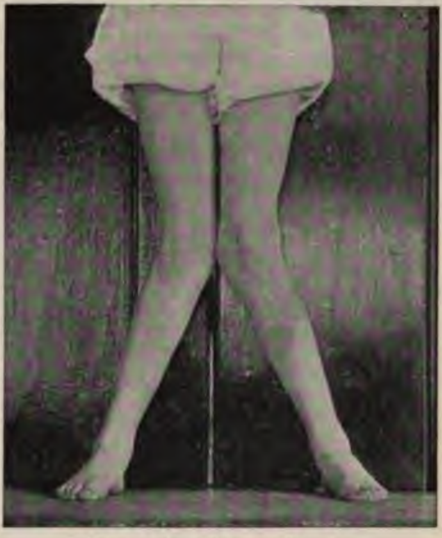

FIG. 196.—KNOCK KNEE.

Abscesses, if large and superficial, are to be treated by incision and drainage. Sinuses may be curetted, and in cases of long standing suppuration, excision or arthreotomy may be indicated. Amputation may be necessary in very bad cases.

For Knock Knee and Bow Legs see Pædiatric Section (Rhachitis).

ACHILLODYNIA

This is an inflammation of the bursa lying between the tendo Achillis and its insertion into the os calcis.

Ætiology.—Strain or injury, usually caused by pressure of shoe. Rheumatism, gout, or gonorrhœa is often the apparent cause of the condition.

Symptoms.—Pain in the back of the heel, aggravated by use of the foot. Local tenderness on pressure; swelling.

Treatment.—Hot air, massage, strapping with adhesive plaster to make pressure over the bursa. In severe cases a plaster of Paris cast. A rubber heel to soften the jar of each step. In chronic cases removal of the bursa by surgical procedure may be indicated.

ANTERIOR METATARSALGIA

Also called Morton's painful affection of the foot. Depression of the anterior arch.

It is a neuralgic pain in one of the phalangeometatarsal articulations, most frequently the fourth. It is a condition of adult life. It is usually unilateral, the second foot becoming affected later. Women are most frequently affected. This has a direct bearing on the ætiology, namely, the wearing of improperly shaped shoes. It is often associated with flat foot. Gout, rheumatism, and general debility are factors in the ætiology. Nervous people also are prone to it.

The symptoms are paroxysms of severe neuralgic pain in the front of the foot, followed by a long continued dull ache and sometimes slight swelling. There is local sensitiveness to pressure. The pain is usually felt only when wearing shoes. The pain is not to be explained by the direct lateral pressure on the sunken anterior arch.

Treatment.—A proper shoe of ample width and with a thick sole and a high arch and low heel. If this does not suffice, a metal plate similar to the one used for flat foot, but continued further forward and with an arch under the heads of the metatarsal bones, is to be worn inside the shoe. Temporary relief is obtained by circular strapping of the front of the foot with adhesive plaster, with a small round pad of felt or leather under the anterior arch.

ANTERIOR POLIOMYELITIS AND PARALYTIC CLUB FOOT

Anterior poliomyelitis is an acute inflammatory disease of the anterior horns of the spinal cord, occurring chiefly in children and resulting in paralysis, more or less complete, of one or both lower extremities. It occurs most frequently in children under the age of five and during the warm months, June to September. The fact that sometimes two children in one family or several children in a neighborhood are attacked with the disease at the same time leads one to think of it as an infectious disease of microbic origin. It also occurs in epidemic form.

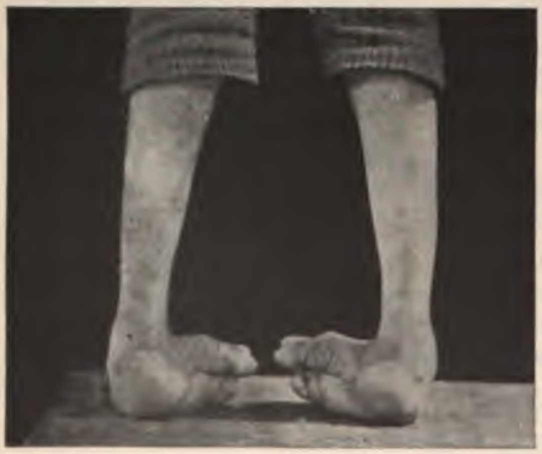

Fig. 197.—Club Foot.
(Hospital for Ruptured and Crippled.)

Symptoms.—The onset is very sudden; a child perfectly well is attacked with fever, gastric disturbances, and sudden paralysis, or, going to bed in perfect health, wakes up the next morning and finds that it cannot move. The lower limbs alone or all four extremities may be paralyzed. The arms quickly recover their power. The paralysis leaves the legs more slowly, some muscles remaining permanently palsied. If the destruction in the nerve centres has been very great, the muscles never recover, the nutrition and growth of the bones of the affected limb are seriously interfered with, and as time goes on the limb may become many inches shorter than the other. The reflexes are lost. The skin of the feet becomes bluish and the extremities are cold from impaired circulation, due to loss of innervation. Sensation is not lost.

The DIAGNOSIS is usually not made until the paralysis has set in.

The TREATMENT of the acute stage must be as energetic as possible, with a view to limiting the inflammation in the spinal cord and the consequent destruction of the nerve centres. It includes counterirritation to the spine, the application of cold in form of ice bags over the spine, and placing the patient on the abdomen to lessen congestion.

After the inflammation has subsided and the chronic stage has set in, it is very important to begin to exercise the muscles passively and actively and to employ massage and electricity. The Krukenberg pendulum apparatus is invaluable in the treatment of these paralyzed muscles; with its aid, even very young children can, with the employment of a little tact, be made to exercise regularly. Parents should be instructed how to manipulate the limbs in order to overcome the tendency to deformity caused by the unopposed action of the healthy muscles.

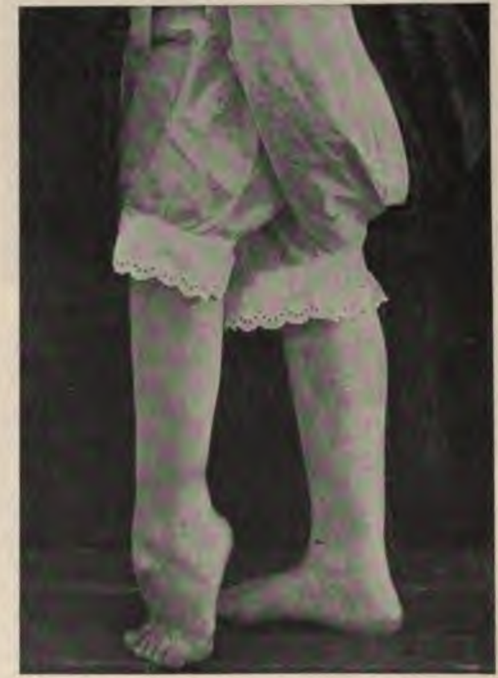

FIG. 198.—TALIPES EQUINUS FROM INFANTILE PARALYSIS. Girl fourteen years.

It is a great mistake to apply braces immediately, for, while they may hold the limbs in a straight position, they cause considerable atrophy of the muscles on account of interference with their use and on account of the pressure of the straps and bands making up the brace. When the muscles have recovered their power as much as they can, it may become necessary to apply a brace to prevent deformity caused by the action of the unopposed muscles and by the force of gravity (toe drop). The kind of brace used will vary according to the extent of the paralysis, a simple upright bar extending to the knee and a foot piece being sufficient for light cases of toe drop or valgus, or double upright bars extending to the hips, with a band about the waist and no joint at the knee or ankle, will be of considerable aid in walking where the thigh and leg muscles are both affected.

A form of treatment extensively used and of growing importance is *tendon transplantation.* The idea of this surgical intervention is to transfer the power of a strong, active muscle to a paralyzed one, and to make it do the work of the paralyzed muscle. This operation is of great value when the limb is only partly paralyzed and there remain some healthy muscles which can be spared from their original purpose and grafted upon some other muscle. In combination with the transplantation, we can also effect a lengthening or shortening of muscles, and it is by the combination of these three methods that the best results are obtained and a cure brought about which formerly was impossible. As examples of the classes of cases in which it may be employed, the following are given: In paralytic pes calcaneus, the peroneal muscles are sewed on to the shortened tendo Achillis.

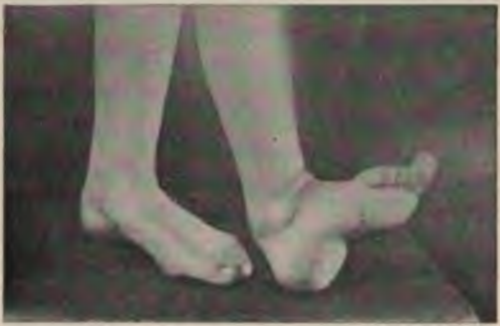
FIG. 199.—TALIPES CALCANEUS.

In paralytic pes valgus with passive lengthening of the tibialis anticus muscles, the tendon of the tibialis anticus is divided, the foot placed in a highly overcorrected position (varus), and the cut ends strongly pulled together and sewed. Then a splice from the tendo Achillis or from the peroneus longus may be sewed on to the tibialis anticus or posticus.

Paralytic Club Foot.—In shortening of the tibialis anticus, if necessary a splice of the tendo Achillis may be sewed upon the paralyzed peroneus longus or the extensor longus digitorum communis.

In paralysis of the quadriceps femoris, the sartorius has been successfully transplanted upon the paralyzed quadriceps extensor femoris. After the operation is completed, the limb is placed in an overcorrected position in a plaster of Paris bandage and retained there for from four to six weeks. The after-treatment consists of massage, gymnastics, and electricity, and the wearing of a retentive apparatus for some months to prevent recurrence. In severe cases, arthrodesis, or removal of the ankle joint, is indicated, as a stiff foot is preferable to the flail joint and furnishes proper support to the body.

FLAT FOOT

Flat foot is that deformity in which the foot is held fixed in the pronated and abducted position. According to Whitman, who proposes the term weak foot, it is one in which the attitude of rest or inactivity persists. The weight of the body falls upon the internal border of the foot and it is supported to a great degree by the ligaments.

There are several varieties. The *congenital* is due to pressure upon the foot in a faulty position in utero; it is not uncommon.

The **acquired, traumatic form** follows sprain, luxation, or fracture of the bones of the ankle joint. It is the usual result of badly set fractures of the lower extremity of the tibia or fibula.

The **paralytic form** is due to paralysis of the plantar flexors and supinators of the foot, following anterior poliomyelitis, cerebral paralysis, etc.

The **rhachitic form** is due to bearing weight on the softened bones, and is seen very frequently in connection with knock knee.

The **static flat foot** is the most important variety. It occurs most frequently in young adults, more especially males, among those who are obliged to stand a great deal or to carry heavy weights. In long continued standing, in order to take the strain from the muscles which assist in holding up the arch, the patient assumes the attitude of rest. He abducts the limbs slightly (spreads them apart), rotates the legs a little outward, slightly flexes the knees, and holds the feet strongly abducted. In this position the weight of the body falls on the inner border of the foot and the ligaments alone support the arch. The deformity is caused by reflex muscular spasm, which in time holds the limb in a false attitude. Flexion in the astragalotibial articulation with extension in the mediotarsal joints is the earliest position of deformity, and it is soon accompanied by abduction and pronation.

SYMPTOMS.—In the earliest stages there are no objective symptoms, and we must be guided entirely by what the patients say. The patient notices that he tires easily; he usually complains of one foot first, for the condition rarely begins in both feet at the same time. The fatigue is felt, not in the foot, but in the calf muscle; this then increases as a feeling of tension and stiffness in the calf, a dull ache. Then, after a greater exertion or long standing or walking on hard floors or a pavement, this feeling extends downward to the internal malleolus, in the tendon of the tibialis anticus, and about the same time the tension is felt in the inner border of the foot. The patient dislikes walking over rough pavements; every stone or unevenness of the ground is painful to him. In this stage the flat foot begins to exert an influence over the patient's mode of life. He walks less and less, uses the cars oftener, sits where he formerly stood, and no longer runs up or down stairs or jumps off the street car; in other words, tries to spare his feet as much as possible. Coldness and numbness and increased perspiration caused by impaired circulation and weakness are common symptoms. There is often a severe burning sensation in the sole of the foot. In the advanced stage of the affection the arch is broken down; the foot is strongly everted, the head of the astragalus standing out as a prominent lump below the internal malleolus; and there is spasm of all the leg muscles,

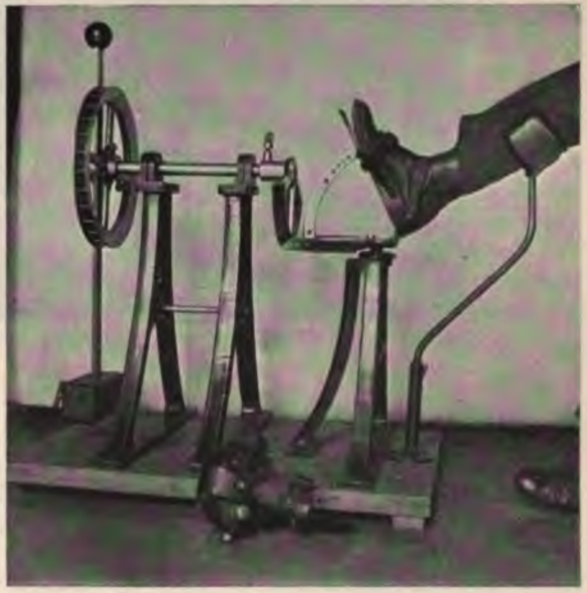

FIG. 200.—KRUKENBERG'S PENDULUM APPARATUS FOR TREATMENT OF FLAT FOOT.

holding the foot rigid, causing the patient to walk with that characteristic flat foot gait, slouchy, stiff, stumping along on his heels. The subjective symptoms at this stage are pain in various parts of the feet or in the calf muscles. The pain increases during the day, as the patients stand on their feet, and they feel better in the morning after the night's rest. The patient has difficulty in walking up and down stairs; after a period of rest during the day, the foot, upon using, is very stiff and painful for several minutes.

TREATMENT.—In mild cases passive movements of the foot should be carried out to the full limit at morning and night, at the same time actively exercising the muscles by standing with the toes together and the heels far apart, then rising on the toes. Besides this, the patient should wear a proper insole to support the arch. In more severe cases, where there are dislocation of the astragalus and muscular spasm, it is necessary to reduce the dislocation and overcome the spasm. This may be done by forcible correction under an anæsthetic and the application of a plaster of Paris bandage in the overcorrected position. After the plaster of Paris is dry, the patient is encouraged to walk about as best he can. The bandages are removed after from three to five weeks. Casts of the feet are taken and steel plates carefully modelled upon these casts. Another method is by the use of the Krukenberg pendulum apparatus (see illustration). This gradually reduces the dislocation, relieves the spasm, and within a short time effects a complete cure, the patient actively assisting in the cure. After exercising from ten to fifteen minutes in the machine, the patient at once experiences great relief from pain and spasm and the foot will readily follow all passive movements. A valuable therapeutic measure is the application to the foot of rubber adhesive strapping. The foot is inverted as much as possible. Two broad strips of plaster are placed on the outer side of the leg, passed under the foot, and held tightly on the inner side of the leg. Narrow strips of plaster are now passed in a figure of eight fashion around the ankle. This dressing gives good support for from ten to fourteen days and may then be renewed. A simple but ofttimes efficacious remedy is the building up of the shoes ¼ to ⅜ of an inch on the inner side.

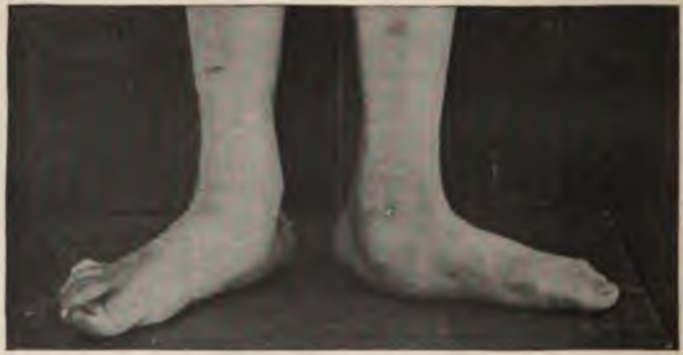

FIG. 201.—FLAT FOOT.

FLAT FOOT OF CHILDREN

Children do not naturally have flat foot. On gross inspection we find the inner border of a child's foot touching the ground. It is apparently flat, and if we take an impression of the foot we find that almost all of the sole makes its imprint. If, however, one closely examines the foot, one will find in place of an arch a thick pad of tissue which gives the idea of a flat foot. This pad is a protection to the normal arch, which is always present. And when we say that the arch is formed in later childhood, we simply mean that this protective pad has disappeared, its function having been served, for now the muscles and ligaments have become firmer and the arch strong enough to bear the weight of the body.

Typical cases of weak foot, however, sometimes present themselves, and we find them in rhachitic children or those whose muscles in other parts of the body are weak or where a child is growing rapidly and the muscles are not able to keep up with the growth.

Flat foot is often associated with knock knee. The symptoms are pain in the arches and calf so that after a little exertion the child tires easily and cannot walk far. There is rarely muscular spasm. On examination we find a thin foot with the normal pad of tissue under the arch missing and the bony structure easily palpable. The head of the astragalus is prominent under the internal malleolus and on the patient's standing we find the arches sunken.

The **treatment** for these cases is by a perfectly fitted Whitman flat foot plate and massage of the foot, with exercises for strengthening the muscles, for only in cases where a positive diagnosis of flat foot is made should any appliance be worn.

The *promiscuous use of corset shoes, ankle supporters, high counters,* and *elastic anklets is distinctly harmful* in that they tend to further weaken the foot by interfering with its function, and are to be discountenanced.

CHAPTER XXIV

OSSEOUS, MUSCULAR, AND ARTICULAR SYSTEM—*Concluded*

MASSAGE, SWEDISH MOVEMENTS, VIBRATORY STIMULATION, AND HOT AIR TREATMENT

REMARKS ON MASSAGE AND SWEDISH MOVEMENTS

The Value of Massage and Movements.—It is often an important question to decide whether motion or rest should be employed in the treatment of disease. As a general rule it may be stated that *rest* should be made use of in all acute conditions of disease when the normal activities are in excess, whereas *motion* should be employed in all chronic conditions when the normal activities are deficient or in abeyance. Again, there are many cases, both acute and chronic, in which the *rest of some part could be combined with motion of other parts of the body.*

We speak of two kinds of motion, *active* and *passive*. The active motions comprise those which originate in the will of the patient and are executed without assistance. The passive comprise all movements executed and controlled by an alien power, independent of the will of the person operated upon.

The familiar forms of massage are *rubbing, kneading, tapping, rocking,* and *stroking. Vibratory massage* is another valuable form of motion. When the patient is more or less vigorous, the simple, or active motions may be employed; when the patient is debilitated, the passive movements or a combination of both are more effective.

Movements systematically employed may be *strengthening* movements, such as *flexion, extension, torsion,* etc.; or stimulating movements, as by *percussion* and *vibration;* or quieting movements, as by *rotation* and *friction;* or purgative movements, such as *kneading, pressing,* and *active movements on the bowels.*

Some movements have a special effect on respiration; others on the circulation. Movements may be so applied as to affect any organ or portion of the body, increasing vital action when it is deficient and decreasing it when it is in excess. Movements cause *an increased flow of blood* to the muscles and soft parts, thereby increasing the circulation and removing accumulations of waste products. They cause absorption of exudations, transudations and infiltrations, and often effect a separation of adhesions in tendon sheaths and joints.

Movements relieve congestion of the brain, lungs, intestines, uterus, liver and kidneys by increasing the flow of blood to the muscles. They directly stimulate the sympathetic nervous system.

From the foregoing remarks it must be evident that some ailments can be cured *more quickly by this method than by any other*, but in the majority of cases, *massage is simply a part of the general management*. In some cases it should be resorted to only as an after-cure or as a means of exercise.

Massage and *movements* are useful in disturbances of the *nervous* and *circulatory systems* and of the respiratory organs, in neuralgia, rheumatism, muscular weakness, gout, paralysis, writer's cramp, insomnia, anæmia, chlorosis, chronic heart disease, cold hands and feet, dyspepsia, constipation, spinal curvature, flat chest, round shoulders, sprained ankle, stiff joints, fracture, etc.

Massage Treatment of the Digestive and Pelvic Organs

Abdominal massage is performed in many ways according to the indications. It may be confined to the superficial structures or may be directed to the deep seated viscera. The principal movements for this treatment would be *friction, kneading,* and *vibration.*

Friction is given by placing both hands over the abdomen, following the direction of the ascending colon and transverse colon on the right side and the descending colon on the left. Such treatment is given a number of times in frequent succession to patients who suffer from indigestion, dyspepsia, and constipation.

Kneading is confined to the superficial structures of the abdomen. The operator takes hold of the flesh and lets it roll through his hands, starting from the middle and working toward both sides.

Vibration massage is used with very good results in cases of chronic dyspepsia and catarrh of the stomach. The manipulation should never take place immediately after a meal.

Generally speaking, abdominal massage promotes peristalsis of the stomach and intestines, facilitates the passage of food and fæces, and takes the place of active exercise in all cases of enforced idleness. In fact, all palpable viscera may have the benefit of massage and vibratory massage treatment. *Therapeutic palpation and massage of the pelvic organs,* in both male and female, are regularly employed and give excellent results in chronic congestion and indurations in which operative treatment is not called for.

Massage as an Aid to the Circulation of Blood and Lymph

Daily muscular contractions by means of exercise aid the circulation of the blood and lymph by causing a pressure on the arteries, veins, and lymph channels. The act of breathing also exerts a suction pump action on the circulation, drawing the blood toward the heart. Muscular contractions produce a pressure on the walls of the veins whereby the blood is forced toward the heart. It has been shown that *effleurage* stimulates the superficial muscles, produces dilatation of the superficial vessels and insensible perspiration, excites the skin reflexes, and, acting through the cutaneous nerves, increases the rapidity of the circulation and the heart beat. Massage forces the *lymph out of the muscles,* increases the velocity of the blood current through the part operated upon, and temporarily decreases the size of a limb while increasing its muscular power.

With the aid of massage and movements, a better distribution of the blood is affected. Through this the nourishment of the whole body is improved. The heart also will thus receive its due nourishment, and retain or regain its power to force the blood regularly to all parts. An irregular action of the heart may disappear, the blood will pass more easily and with less obstruction through the lungs, and respiration will become deeper and easier.

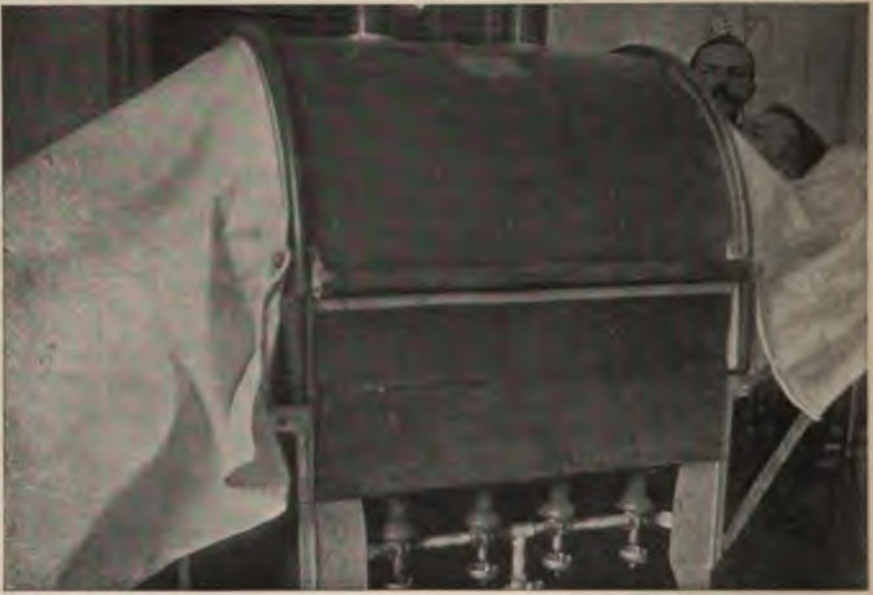

FIG. 202.—DRY HOT AIR TREATMENT.

Treatment of Stiff Joints by Massage and Movements

The greatest care is required in the treatment of joints, since it is quite possible to provoke fresh inflammatory action by rough handling. When massage is carried out without violence and with good judgment, *it gives better results than any other form of treatment.* The pain and discoloration will in a very short time disappear, the tension diminishes as the products of inflammation are carried off, the fever temperature falls, the natural outlines reappear, extravasated blood is dispersed, and adhesions between the torn and bruised surfaces are effectually prevented.

Treatment of Sprains by Early Massage

It is a well known fact that massage is of the greatest value in both acute and chronic cases. The earlier the patient receives treatment the sooner will he enjoy its good effects. Immediately following the injury the parts are very tender; perhaps the whole limb is swollen, the joint distended with blood and very hot to the touch.

In a case of this nature the patient should be treated by gentle effleurage (slight stroking) performed with the palm of the hand and of from ten to fifteen minutes' duration.

As soon as the acute pain has disappeared, the masseur can apply friction manipulation, performed with the tips of his fingers to force away exudates. The masseur should begin at some distance from the affected part and work his way gradually to it. After a few treatments the joint becomes quite free and almost painless. The patient may then be allowed to use his limb, and if the pain does not return the exercises should be increased day by day. The limb should be bandaged, and a continuous hot application is serviceable. Provided there is no fracture, five to ten days of treatment will bring about a return to the normal condition of the parts.

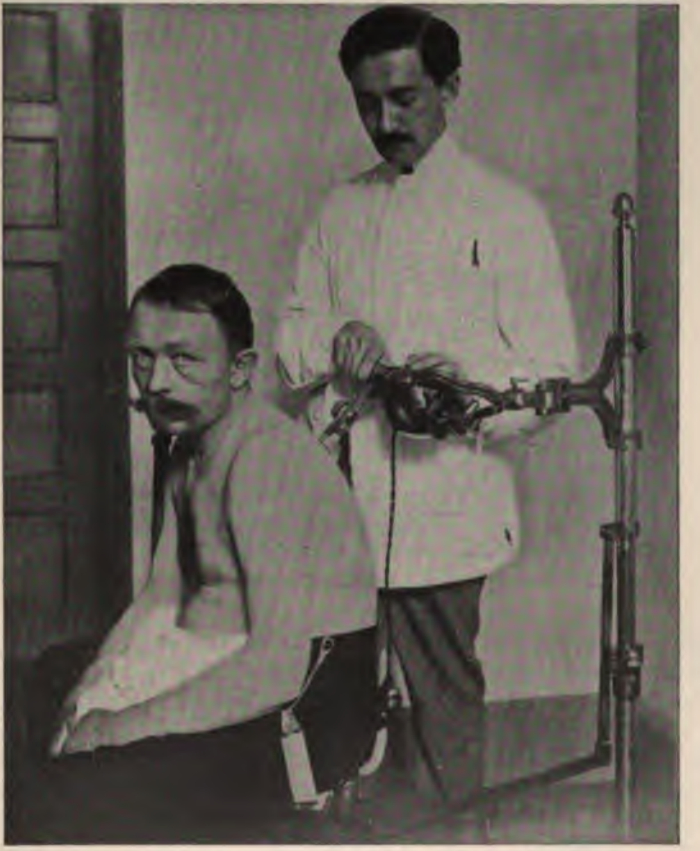

FIG. 203.—APPLICATION OF THE CHATTANOOGA VIBRATOR.

When manual treatment by massage and systematic movement are inadequate, we may call to our aid the various mechanical devices, such as the *pendulum apparatus* and the *vibratile.*

MECHANICAL VIBRATION; VIBRATORY MASSAGE; VIBRATORY STIMULATION

Mechanical vibration by means of the oscillating vibrator (see cut) is an important aid in the treatment of many functional and organic derangements. It increases the flow of blood and lymph to and from a given area or organ, thereby stimulating secretion and excretion, encouraging muscular and general metabolism, and relieving tissue congestion, muscular rigidity, and pain. Like massage, it aids the general and local circulation and indirectly improves respiration, digestion, secretion, and excretion.

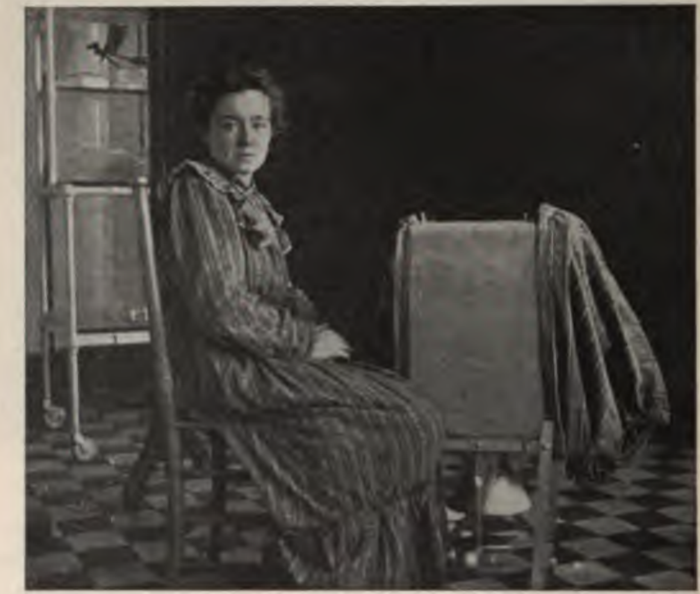

Fig. 204.—Dry Hot Air Treatment for Arm or Leg.

Vibratory treatment may be applied to any accessible tissue or organ, and is particularly useful in *chronic muscular rheumatism*, in gastric and intestinal indigestion, in constipation, in chronic Bright's disease, in sciatica, in lumbago, in sprains, in neuritis and neuralgia, in chorea, in goitre, in insomnia, in many pelvic and joint inflammations, and in paralyses.

Generally speaking, it has about the same indications as massage, and may be employed daily or every other day for fifteen to thirty minutes.

DRY HOT AIR TREATMENT

By means of an ovenlike apparatus hot air at a temperature of 200° to 400° F. may be applied to almost any part of the body. This treatment is useful in all chronic inflammatory conditions, by facilitating the transfer of blood and lymph. It may be used in conjunction with massage and vibratory massage in chronic affections of the joints, particularly in chronic rheumatism, witn and without plastic deposits, in gout after the acute stage is passed, and in all forms of neuralgia and neuritis from any cause whatsoever. The patient, after being undressed and wrapped in blankets, has his arm, leg, or any convenient portion of his anatomy placed inside a specially constructed cylinder which is heated to the required degree by gas, oil, or electricity. The exposure is continued from half to three quarters of an hour. This causes profuse perspiration and elevates the bodily temperature one or two degrees.

CHAPTER XXV

INFECTIOUS AND CONTAGIOUS FEVERS

SYNOPSIS: Introductory Remarks.—Prophylaxis and Disinfection.—Malarial Fevers.—Enteric, or Typhoid, Fevers.—Influenza.—Yellow Fever.—Typhus Fever.—Dengue.—Relapsing Fever.—Asiatic Cholera.—Variola.—Vaccinia and Vaccination.—Bubonic Plague.—(For Measles, Rubeola, Varicella, and Scarlatina, see Pædiatrics.)

INTRODUCTORY REMARKS

INFECTION is the invasion of the body by animal or by vegetable parasites, bacteria, protozoa, etc. There are two principal factors in infectious disease, the seed and the soil. In good soil the destruction of pathogenic germs goes on all the time. Infective fevers are caused by specific microbes which disturb or destroy cellular health. In some instances the disease germ is known and can be handled by modern bacteriological methods. In many diseases the specific germ is as yet unknown. Infective diseases are directly or indirectly communicable in a high or low degree. A knowledge of the mode of infection and the portal of entrance of infective disease is of the utmost importance as regards prophylaxis. These points will be discussed under each separate disease; generally speaking, we know that a lowered state of health from any and all causes is a predisposing factor. In some individuals there is a natural resistance or an acquired immunity to infection. Certain individuals are particularly apt to contract infectious disease, and in almost all persons there is a liability to infection at certain periods and at certain ages. The new-born are liable to infection through the navel. In early childhood the gastroenteric and respiratory tracts are frequently the portals of entrance. Syphilis, gonorrhœa, and chancre are threatening diseases from the age of puberty up. Cancer invades the body more readily after middle life. Tuberculosis, influenza, pneumonia, malarial poisoning, and many other infectious diseases are encountered at any age. In some instances we find *visible manifestations* of the disease at the portal of entrance, as in diphtheria and in syphilis. In the majority of diseases there are no visible manifestations at the portal of entrance. The symptom group which is common to infective fevers consists of fever, a chill, sweating, a rapid pulse, loss of appetite, and various neuralgias. In addition we often observe special manifestations, such as skin eruptions, diarrhœa, etc.

Fever plays an important rôle and is accompanied by an increased burning up of body tissues (muscles and fat). *Albuminuria* is a phenomenon frequently observed in infective fevers. *Secondary anæmic conditions* often follow in the wake of infections. *Heart* and *kidney complications* with *œdema,* also cerebral manifestations, are not infrequent. As regards treatment, it may be stated that in the present state of our knowledge we have specific treatment only in malarial disease, syphilis, and diphtheria. The management of all other infections is symptomatic and general. The therapeutics of the future will probably deal more with substances derived from the animal body. Under general management we class the maintenance of nutrition and of the circulation, antipyretic measures, and elimination by the intestinal tract, by the kidneys, and by the skin. Antipyretic drugs are only occasionally useful. Hydrotherapeutic measures are to be preferred to drugs for reducing the temperature. The routine practice of administering antipyretic drugs as soon as the temperature rises somewhat above the normal is positively bad. Quinine as an antipyretic is indicated only in malarial fevers. Drug stimulants, laxatives, and hydrochloric acid for the purpose of aiding digestion are the only drugs useful in this class of cases.

REMARKS ON PROPHYLAXIS AND DISINFECTION

It is not within the scope of this chapter to speak of State and interstate sanitary regulations, but it may be mentioned that the enforcement of laws against river pollution and the sanitary supervision of inland transportation are extremely lax in our country. Quarantine and disinfection at our various seaports have been effectively carried out, and this service will doubtless continue to still further improve as soon as we have established a national board of health, and it would appear that the Marine Hospital Service has the necessary machinery for carrying on such work.

The municipal control of infectious disease is satisfactory to a certain extent. When the efforts of our health boards fall short of the mark, it is well to remember that the health reformer cannot travel far beyond the popular standard of enlightenment in such matters. Moreover, many practitioners of medicine are lax and derelict in their duties as sanitarians, and some sanitary inspectors and officials are meddlesome and shortsighted. The disinfection by fumigation of sick rooms with their various contents, in tenement houses, is practically a farce. Much would be gained by prohibiting carpets and wall paper in tenement houses. The modern steam heated and carpeted apartment houses with hopper closets and complicated plumbing on each floor, and a scarcity of sunshine and fresh air, are insanitary, to say the least, and in many respects inferior to the old style of tenements. Although the poor in our large centres of population may never be able to enjoy sanitary dwellings, the authorities should see to it that conditions are not created which are positively bad.

The general principles involved in the prevention of infectious disease are not complex:

1. Isolation of the patient and avoidance of the sick room.
2. Disinfection of rooms and contents by steam or chemicals or by cleanliness and sunshine; personal disinfection and prophylaxis, including fortifying the system.
3. Ventilation to prevent concentration of poisonous matter.

The management of a case of contagious fever in a private house according to these principles is not difficult. The patient is isolated in a clean room, bare of all but the necessary furniture. A hall bedroom or one on the top floor is to be preferred. In some instances it may be advisable to keep the patient in the ordinary bedroom occupied at the time of his being taken sick, and quarantine, in the best manner possible, this floor of the house, already infected. The well children are to be kept from school and church. Where the intercourse of parents with a sick child cannot be avoided, even when trained nurses are employed, it may become necessary to isolate the well children. Food and drink not consumed by the patient must be burned or disinfected in a slop jar holding a chlorinated soda solution. Dishes should be rinsed in soda solution, 5 per cent, and a sublimated solution, 1 to 1,000, before returning them to the kitchen. As dried sputa are apt to spread through the air, all expectorated matter should be received into rags or paper spittoons, which are to be burned, or into a jar holding a sublimate solution, 1 to 1,000. The sick room should not be swept with a broom, to avoid raising dust. For cleaning purposes, employ moist rags, which are to be burned. Urinals, bed pans, and fæces are treated with quicklime, bichloride solution, 1 to 1,000, or Labarraque's solution.

The nurse should not eat or drink in the same room with the patient, and before going to meals she should clean her hands and arms with green soap and sublimate solution, 1 to 1,000, and put on a clean, long, loose gown, which hangs outside of the sick room. During the period of desquamation the patient should receive a daily bath of tepid water containing green soap. At the termination of a case the nurse takes a bichloride bath, 1 to 2,000, and washes her hair with the same solution. In case of death, the body is to be wrapped up at once in a bed sheet soaked in mercuric bichloride solution, 1 to 1,000, and no public funeral is to be permitted. The sick room and all objects in it must be disinfected (see subsequent rules). Hard finish or painted walls and ceilings and floors may be washed or sprayed with disinfecting fluids. Papered walls may be rubbed down with a damp cloth or bread crumbs, or, better still, the paper should be removed. A fresh coat of kalsomine or whitewash is advisable wherever it can be applied. After disinfection, the windows must be kept open day and night for several days. Carpets, upholstered furniture, and other articles can be disinfected by steam through the health board or at private disinfecting plants.

Period of Isolation.—Scarlet fever patients are not to be returned to school until the lapse of six weeks or more.

Measles, four weeks or more.

Diphtheria, until cultures from the throat show that infection has disappeared.

Varicella (chickenpox), four weeks.

Pertussis (whooping cough), indefinitely.

In small towns and villages with scattered dwellings the spread of contagious disease is easily prevented by isolation and rigid quarantine. The health officer of a town will placard the infected house and employ one or two persons to watch the premises and carry supplies to the inmates. From personal observation I am convinced that this supervision is lax, and sympathetic neighbors are permitted to go in and out *ad libitum*. Disinfection by steam is not feasible in small towns. Articles which are not to be destroyed should be disinfected by a lengthy exposure to sunlight and fresh air.

In the homes of the poor in our large cities preventive measures cannot be thoroughly applied. The conscientious practitioner will perhaps advise the removal of the patient to an isolating hospital, and in the event of refusal will do the best he can under the circumstances. He may order the patient to the front or rear room having the most light and air, and lock the door leading to the other apartments, entrance to the sick room to be had by way of the hall. A tub of 3 per cent carbolic acid solution or Javelle water and a cake of sapolio should be placed in the sick room for washing hands and for soiled linen, dishes, discharges, and bed pans. Whenever the removal of a sick child to an isolating hospital is objected to by the parents, the health officers have no moral right to part mother and child, in the opinion of the writer. Whenever such a removal is imperatively demanded, such provisions should be made that the mother may accompany the child.

Prevention of Infectious Disease in Schools.—It is well known that our crowded schools are hotbeds for breeding infectious diseases. It is the experience of most families having children that all goes well until one or more children attend school. The writer desires to draw attention to the fact that most of our city churches and armories are unoccupied during school hours, and it would seem feasible to arrange for their utilization as school houses. If this suggestion should meet with favor, the difficulties of carrying out this plan could readily be overcome. Our municipal health board has made some well directed efforts to improve the hygiene of our schools in various ways.

Attention has been drawn to the clothes room as a source of infection. Moist or damp overcoats and wraps hanging for hours in a steam heated room or closet are an excellent breeding ground for infectious germs. This is a real danger, and should merit the attention of the authorities. The overheating of school rooms is a perennial source of discomfort and danger, notwithstanding all that has been talked or written against it. An inexpensive automatic temperature regulator would overcome this difficulty. It is well known to teachers and physicians that children frequently attend school with contagious fevers, contagious sore throats, transmissible skin disease, ophthalmia, etc., and that they infect others during school hours. To avoid this, a rapid inspection of school children by qualified persons is necessary. This can be done before school hours, as they assemble in the courtyard, and every child found sick should be sent home with a card bearing the inscription: "*Your child is sick; consult a physician at once.*"

As soon as a case of infectious disease is reported to the health board, all school children from the infected house are sent home. After the termination of the case the health inspectors should remove such restrictions by at once notifying the school officers and the housekeeper of the infected house.

In New York City this is not always promptly attended to, and parents are compelled to adopt the roundabout way of calling on the family physician for a clean bill of health. Finally, it must be urged that school buildings be thoroughly disinfected during every vacation. Sulphur fumigations appear to be inadequate. Chlorine and formalin fumigations have been employed with success.

The practice of compelling parents to keep children convalescent from diphtheria indoors and confined to the sick room until all bacilli have disappeared from the throat is unreasonable, because it deprives the convalescents of the tonic effects of fresh air, which they require, and because the infectious nature of diphtheria bacilli found during convalescence and later on *has not been proved.*

Professor Dunbar, the director of the Hamburg Hygienic Institute, recently informed the author that school children were permitted to reenter the schools in Hamburg very soon after the clinical symptoms of a diphtheritic infection had subsided, and that no notice was taken of the presence or absence of diphtheria bacilli in such cases, because careful investigation of such factors in schools and asylums had shown that the so called bacillary precautions had not been followed by noteworthy results.

One of the most cruel results of the Sanitary Code as practised in some of our large cities is the taking away of children suffering from ordinary every day eruptive fevers and transferring them to a suburban department hospital, against the will of the parents, when such cases are reported from a hospital or from an apartment some portion of which is utilized for business purposes.

This enactment is directed chiefly against the poor, and has given rise to so much bitterness of feeling that in very many instances the fear of the compulsory removal of a child to a department hospital has prevented parents from calling in a physician and has kept well meaning and humane physicians from reporting such cases.

It must be conceded that in many instances it would be to the interest of all concerned if cases of communicable disease could be treated in a proper hospital; but to compel parents to give up their children in ordinary cases of illness is wrong. It is far better to take no stringent precautions than to cast discredit upon sanitation in general by enforcing cruel and unnecessary laws. If the community demands isolation under all circumstances, the authorities should insist upon securing proper accommodations for mother and child.

Personal Prophylaxis.—It is positively known that a number of infectious and contagious diseases enter the animal economy through the nasopharynx, but the general practitioner does not appear to appreciate the importance of such observations. The writer has pointed out on various occasions that scarlet fever and diphtheria are very apt to attack children having decayed teeth, large tonsils, and adenoid vegetations. And it has been stated by good authority that the tubercle bacillus frequently enters the system through the nasopharynx, and from there travels to the bronchial glands and the lungs. Therefore carious teeth in children should be extracted or filled, and large tonsils and adenoids removed. Children exposed to diphtheria and scarlet fever should receive a teaspoonful of salt water in each nostril several times a day. This will carry away putrescible matter from the nasopharynx and prevent infection. (See Nasopharyngeal Toilet.)

Disinfectants

The Disinfection of Rooms.—1. All cracks or openings in the plaster or in the floor or about the door and windows should be caulked tight with cotton or with strips of cloth.

2. The linen, quilts, blankets, carpets, etc., should be stretched out on a line in order to expose as much surface to the disinfectant as possible. They should not be thrown into a heap. Books should be suspended by their covers so that the pages are all open and freely exposed.

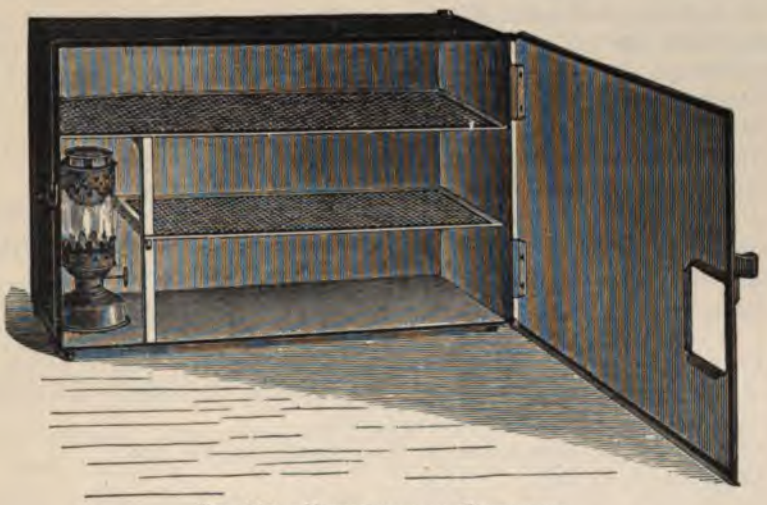

FIG. 205.—FORMALDEHYDE STERILIZER.

3. The walls and floor of the room and the articles contained in it should be thoroughly sprayed with water. If masses of matter or sputum are dried down on the floor, they should be soaked with water and loosened. No vessel of water should, however, be allowed to remain in the room.

4. Five ounces of the commercial 40 per cent solution of formaldehyde (formalin) for each 1,000 cubic feet of space should be placed in the distilling apparatus and distilled as rapidly as possible. The key hole and spaces about the door should then be packed with cotton or cloth.

5. The room thus treated should remain closed for at least ten hours. If there is much leakage of gas into the surrounding rooms, a second or third disinfection with formaldehyde at intervals of two or three hours should be made.

In the absence of a distilling apparatus, formalin fumigation may be obtained by mixing one quart of 40 per cent formaldehyde and 6½ ounces of potassium permanganate in a porcelain dish floating in a tub of water. The person mixing the chemicals must leave the room at once. The quantities mentioned are sufficient for a good sized room.

For Excreta.—In the sick room:

For spore containing material:

1. Chlorinated lime in solution, 4 per cent.
2. Mercuric chloride in solution, 1 to 500.

In the absence of spores:

3. Carbolic acid in solution, 5 per cent.
4. Sulphate of copper in solution, 5 per cent.
5. Chloride of zinc in solution, 10 per cent.

In privy vaults:

Mercuric chloride in solution, 1 to 500.

For the disinfection and deodorization of the surface of masses of organic material in privy vaults, etc.:

Chlorinated lime in powder.

For Clothing, Bedding, etc.—Soiled underclothing, bed linen, etc.:

1. Destruction by fire, if of little value.
2. Boiling for at least half an hour.
3. Immersion in a solution of mercuric chloride of the strength of 1 to 2,000 for four hours.
4. Immersion in a 2 per cent solution of carbolic acid for four hours.

Outer garments of wool or silk, and similar articles, which would be injured by immersion in boiling water or in a disinfecting solution:

1. Exposure to dry heat at a temperature of 110° C. (230° F.) for two hours.
2. Fumigation with sulphurous acid gas for at least twelve hours, the clothing being freely exposed and the gas present in the disinfection chamber in the proportion of four volumes per cent.

Mattresses and blankets soiled by the discharges of the sick:

1. Destruction by fire.
2. Exposure to superheated steam—25 pounds pressure—for one hour. (Mattresses to have the cover removed or freely opened.)
3. Immersion in boiling water for one hour.
4. Immersion in the blue solution (mercuric chloride and sulphate of copper), two fluid ounces to the gallon of water.

For Furniture and Articles of Wood, Leather, and Porcelain.—Washing, several times repeated, with:

1. Solution of mercuric chloride, 1 to 1,000. (The blue solution, four ounces to the gallon of water, may be used.)
2. Solution of chlorinated lime, 1 per cent.
3. Solution of carbolic acid, 2 per cent.

For the Person.—The hands and general surface of the body of attendants, of the sick, and of convalescents at the time of their discharge from hospital.

1. Solution of chlorinated soda diluted with nine parts of water (1 to 10).
2. Carbolic acid, 2 per cent solution.
3. Mercuric chloride, 1 to 1,000; recommended only for the hands, or for washing away infectious material from a limited area, not as a bath for the entire surface of the body.

For the Dead.—Envelop the body in a sheet thoroughly saturated with:

1. Chlorinated lime in solution, 4 per cent.
2. Mercuric chloride in solution, 1 to 500.

3. Carbolic acid in solution, 5 per cent.

To Prevent the Spread of Specific Vulvovaginitis the Following Rules are to be Observed.—All vessels are to be sterilized immediately after use.

Chamber marked *clean* is to be used for *clean* cases only.

Chamber marked *vaginitis* is to be used for *vaginitis* cases only.

Douche pans ditto.

All wash cloths are to be sterilized after use.

The night blankets of any child with vaginitis are to be kept on the bed and not used for any other child.

All diapers worn by girls are to be first cleansed and then sterilized for twenty minutes.

To Prevent the Spread of Diarrhœal Disorders.—A nurse must thoroughly cleanse her hands with *green* soap before feeding the child suffering from diarrhœa. All soiled diapers are to be put in a 2 per cent solution of crude carbolic acid as soon as they are removed from the child.

INFECTIOUS AND CONTAGIOUS FEVERS

MALARIAL OR INTERMITTENT FEVERS

Ætiology.—A specific infectious disease with intermittent or remittent fever due to the presence in the blood of several species of *hæmosporidia* which develop in the blood at the expense of the red blood cells.

Geographical Distribution.—Malarial fevers occur in almost all parts of the world except in the coldest regions, and are most prevalent in moist tropical regions. The pernicious forms are seen in tropical Africa, India, and South America. Intermittent fevers are limited to swampy areas, along river valleys, at the foot of mountains, and on coast districts, or wherever there is stagnant water and at the same time wherever there are the *Anopheles* mosquitoes.

Parasitology of Malarial Fevers.—Certain varieties of mosquito (*Anopheles*), whose geographical distribution is as yet imperfectly known, are the intermediate hosts of the malarial fever parasite, which undergoes a cycle of existence in the insect lasting for about ten days. At the end of this period *sporoids* may be introduced into the human body with the bite. Mosquitoes are, as far as known, the only means of conveying malaria.

The infectious agents belong to the class of *Sporozoa* and to the order named *Hæmosporidia*, and were discovered in 1880 by a French army surgeon, *Laveran*. Three distinct species have been distinguished:

The *tertian fever* parasite, the *quartan* fever parasite, and the *æstivo-autumnal* fever parasite. Malaria is so widely disseminated over the world and the opportunity for continued infection of the mosquito so great that it seems almost hopeless to try to eradicate the disease. The principle upon which malaria may be fought has been suggested by science and has proved of value. This involves the destruction of the mosquito and its breeding places, the prevention of the infection of the remaining mosquitoes by isolation of the malarious individual from the mosquito, and the diminution of malarial material in man by an attempt to cure him with quinine and other antimalarial remedies.

Experiment has already demonstrated that non-immune individuals may live safely in the most malarious districts with adequate yet simple protection from the sting of the mosquito infected with malaria. Man thus protected against malaria may now explore, settle in, and develop regions of the earth hitherto inaccessible because of the danger from the deadly tropical malaria.

Prophylaxis of Malaria.—The health board of New York has issued the following lucid instructions regarding the prevention of malaria which embody our present knowledge of the subject.

This disease, which is also called "ague," "chills," "chills and fever," and "dumb ague," has been thought due to stagnant water, to upturned soil, to bad air, and to other causes. It has now been proved beyond doubt that it originates from the bite of a certain kind of mosquito (*Anopheles*) and as a rule *in no other way*. This mosquito is not created with malaria, but gets the germs into its stomach by biting a person already infected. After the lapse of about eight days, such a mosquito becomes capable of infecting other persons, previously healthy, by its bite, thus passing the disease on indefinitely.

To prevent malarial disease, therefore, we must either destroy the dangerous mosquitoes or avoid their bites. In practice, both expedients are desirable. As the malarial mosquitoes bite as a rule only at night, one will usually be safe by protecting the bedroom, either with screens at the windows or with a mosquito bar carefully arranged over the bed. Before going to bed one should kill all the mosquitoes resting on the bedroom walls, in the closets, or under articles of furniture, as the insects already in the room are most apt to give trouble. Moreover, all cases of malarial disease already developed must be carefully isolated under mosquito netting until pronounced by a competent physician to be cured. Otherwise, malarial mosquitoes biting these persons, and flying out of doors again, may carry the infection some distance in all directions. Various epidemics in our suburbs, in past summers, have been thus begun.

The other and still more important measure is to *prevent the breeding* of mosquitoes in one's neighborhood. All mosquitoes, the malarial as well as the common household pests which only annoy us, require standing water to lay their eggs in. Mosquitoes will lay in water barrels, pans, tin cans, wells, springs, rain pools, cesspools, pots, kettles, drainage traps, ponds—in short, anywhere where stagnant water is found. Running streams are not apt to support the young, unless the current is sluggish. Large bodies of water are usually kept clear by the small fish in the water—minnows, small sticklebacks, sunfish—except when the margins of the water are cumbered with grass, slime, or leaves, preventing the fish from getting at the mosquito larvæ, which are very expert at hiding. Mosquitoes, as a rule, cannot live in salt water. To kill the mosquito larvæ, therefore, the rule is simple: *no standing water*. Where standing water *must be had* for washing or drinking, the top of the receptacle should be closely covered with wire gauze—not the smallest opening being left at the margin. When drainage cannot be made possible, the surface of the water should be covered with a film of kerosene oil. The oil may be poured on from a can or sprinkler. It will spread of itself. One ounce of oil to fifteen square feet of water is enough.

The oil must be renewed about once a week during the mosquito season. A solution containing 1 pound of sulphate of copper and 1 pound of unslaked lime in 10 gallons of water will cause the death of mosquito larvæ when added in the proportions of one gallon of solution to 50 gallons of infected water.

Mosquitoes do not fly far from their breeding places, and if all the householders in a given neighborhood will observe the simple rules given, experience has already amply proved that the results will be amazing. Persons keeping stagnant water on their premises are guilty of maintaining a nuisance, and it is the purpose of the department to proceed against all who neglect the warning of the department in this respect. Where large bodies of water, the drainage of which is too expensive for private enterprise, are in question, the department hopes to enlist the assistance of the proper city authorities, so that there need be no reason why the plague of mosquitoes and malaria in the suburbs of New York should not be entirely removed.

The Infection in Young Children.—A most important fact which was independently observed by Koch in Africa, is that in a native population in a malarious region, while the adults may be perfectly free from the disease, an enormously large percentage of the young children contain the parasites in their blood. Though the disease appears to be much less dangerous to the native children than to the newly arrived, implying that they have a degree of congenital immunity, the parasites in the young natives are perfectly efficacious in causing dangerous fever in white people, when conveyed to them by mosquitoes. Hence the important practical inference that white people settling in a malarious tropical region should not, as they now commonly do, plant their houses near native settlements, but place them at some considerable distance from them, about a quarter of a mile being apparently sufficient. Christophers and Stephens in their last communication have gone so far as to express the opinion that the following of this simple rule would go very far indeed toward rendering the malarious tropics healthy for Europeans.

The routine administration of quinine to the malaria bearing native population in order to avoid the infection of new broods of mosquitoes is, in most regions, beyond possibility. But a combination of these methods and the general use of mosquito netting is bound to yield good results. Sooner or later we shall find some plant that will prevent the breeding of mosquitoes or some innocuous gnat which will displace the dangerous *Anopheles*.

Symptoms.—The symptoms differ according to the species with which the individual is infected. A paroxysm of fever has four stages: Premonitory symptoms, chills, fever, and sweating.

The premonitory symptoms are headache, languor, nausea and vomiting, yawning, and a feeling of cold.

The Chill.—The patient shivers and shakes, the skin is cool, pale, or cyanotic, the pulse is rapid, small, and hard, and the temperature rises rapidly.

The Hot Stage.—The skin becomes hot and flushed, the eyes are injected, there is headache, sometimes with active delirium, the pulse is full and bounding, the temperature reaches its maximum—105°, 106°, or 108°, and the fever drops in from six to eight hours by crisis.

The Stage of Sweating.—Sweating sets in as the temperature falls, and all the other symptoms rapidly disappear. The duration of the paroxysm is from eight to twelve hours, and the paroxysm returns with free intervals of one or more days. Herpes labialis is a common occurrence in malarial fever.

Course and Termination.—After the disease has lasted for about two weeks the patient may get well without any special medication. A persistence of the fever leads to anæmia, to jaundice, and ultimately to chronic cachexia.

Diagnosis.—The diagnosis is established by means of a blood examination, also by the *therapeutic test*, i. e., the administration of repeated full doses of a quinine salt (gr. 5 to 15). That an intermittent fever is not malarial may be affirmed with almost absolute certainty if it does not cease after applying the therapeutic test for several days.

Differential Diagnosis.—It is clinically important to know that various diseased conditions are accompanied by intermittent pyrexia.

In *pyæmia* or *concealed suppuration*, the chills, fever, and sweats occur at irregular intervals, the plasmodium is absent, and quinine has no influence.

In *tuberculosis* the therapeutic and blood tests are negative and tubercle bacilli are present in the sputum in pulmonary cases. Incipient tuberculosis and chronic malaria are difficult to distinguish one from another.

Pyelitis may closely simulate intermittent fever. We find in such cases pyuria, leucocytosis, a tender and swollen kidney, and no response to the therapeutic or blood test. Pyelitis may, however, be due to malarial infection.

Ulcerative endocarditis with an intermittent fever curve is recognized by the history, the clinical symptoms and physical signs, and failure to respond to the blood or therapeutic test. Ulcerative endocarditis with and without choreic movements may follow in the wake of malarial infection in children and adults.

In *gallstone colic* with chill and intermittent pyrexia the blood and therapeutic tests show negative results.

Typhoid Fever.—Remittent malarial fever may simulate typhoid fever very closely. In the absence of both the Widal reaction and the plasmodium test, a fever of over a week's duration which resists the action of quinine is usually typhoid fever.

To distinguish *pernicious malarial fever* with jaundice from *yellow fever* we rely upon the blood test.

Clinical Varieties.—Intermittent malarial fevers (quotidian, tertian, quartan); remittent malarial fevers; pernicious malarial fever (algid, comatose, and hæmorrhagic forms); malarial cachexia; dumb ague, or larvate malaria, the masked, irregular type.

Symptoms of Malarial Fevers.—The symptoms of malarial fevers differ according to the species of parasite with which the individual is infected.

QUARTAN TYPE.—The paroxysm, which may last from eight to twelve hours, consists of three stages, chill, fever, and sweating, occurring regularly every fourth day, with headache and pain in the back, nausea, vomiting, and diarrhœa. Irregular or continued fever as a result of the infection with multiple groups of parasites may also be present.

Tertian Type.—The paroxysm occurs every other day. Infection with two groups of tertian parasites results in daily paroxysms.

The æstivoautumnal type, or remittent malarial fever, is a more severe type which occurs in temperate regions only at the height of the malarial season. The fever is irregularly intermittent, remittent, or continuous. Frequently the chills are absent and the fever resembles that of typhoid fever.

Pernicious Fever.—The malarial paroxysms may assume a malignant and fatal form with all the characteristics of an intense infection, including the comatose state. This type, like the remittent fever, is due to the æstivoautumnal parasite and is rare in temperate zones. In the *algid* form the onset is sudden with vomiting, watery diarrhœa, and collapse. Sometimes there is anuria, and the patient may die from exhaustion with a subnormal temperature. The *comatose form* is accompanied by high fever and active delirium. Recurrent attacks are often fatal. In the *hæmorrhagic forms* an acute hæmorrhagic diathesis develops with subcutaneous ecchymoses and hæmorrhages from any surface, and with all the symptoms of toxæmia, such as jaundice, hæmaturia, hæmoglobinuria, albuminuria, anuria, and uræmia, and not infrequently death results.

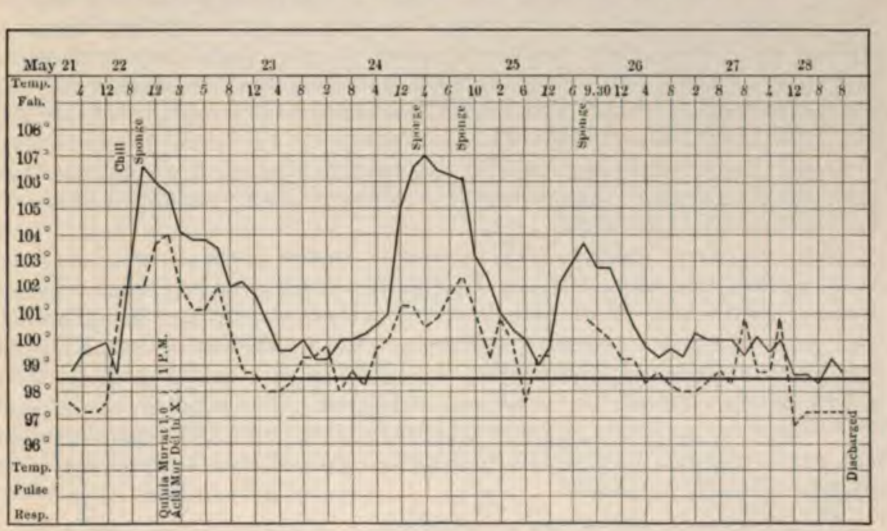

Fig. 206.—Tertian Malaria.

Malarial Paroxysms with Long Intervals.—The intervals may be five or six days or even weeks, may occur in all three types of infection, and are due to the fact that many parasites are destroyed at the time of sporulation and a new incubation period must be passed through before the number is sufficient to cause renewed symptoms. In all forms of malarial fever the spleen is generally enlarged.

Malarial Fever Cachexia.—The general symptoms are those of splenic anæmia with breathlessness on exertion and œdema of the ankles. The spleen is large and hard and the liver is often enlarged. The skin has a dirty yellow color and is sallow. The temperature may be normal or it may vary from 99° to 103°. The red blood cells may sink in numbers to one million. Retinal and other hæmorrhages may occur.

LATENCY AND RELAPSE in intermittent fevers are clinical expressions of numerical fluctuations which occur in the successive broods of parasites in connection with conditions more or less favorable to their multiplication in the blood. During latency the slightest change in the condition of the host, such as exposure to cold, fatigue, and intercurrent disease, may give rise to a relapse.

THE MASKED IRREGULAR TYPES are a subacute form of malarial fever with malaise and various neuralgias, and they are oftener seen in children than in adults. (See Pædiatrics.)

Complications of Malarial Fever.—In about 10 per cent of cases we observe complications in malarial fever, involving the gastroenteric, respiratory, circulatory, urinary, and central nervous systems and the organs of locomotion, particularly shown by jaundice, cardialgia, and enteralgia, pain in the muscles and joints, wry neck, tendovaginitis crepitans, nephritis, and bronchopneumonia. *Trophic disturbances*, such as redness of the eyelids and corneal ulcers, have been observed by the author. *Paraplegia* is reported as a rare complication. *Bronchopneumonia* is a common complication in children. *Endocarditis, acute and chronic*, has followed in the wake of malarial infection.

MALARIA AS A COMPLICATING FACTOR IN OTHER DISEASES may give rise to a development of misleading and grave symptoms, particularly in abdominal affections. Mild attacks of gallstone, renal, and appendicular colic or indistinct ileocæcal symptoms, with subsequent fever and chills due to a complicating malaria, are not at all of rare occurrence, and give rise to serious errors in diagnosis and treatment. The same is true of post-operative fever and chills; therefore the careful clinician will apply the blood test or therapeutic test before *advising an operation or a repetition of an operation already performed.*

For malaria in children, see Pædiatrics.

Prognosis.—In intermittent malarial fever the prognosis is favorable with proper treatment, and in remittent malarial fever it is usually favorable, although death may occur in severe cases. In pernicious malarial fever the mortality ranges from 20 to 25 per cent. In malarial cachexia the outlook is fairly good. The spleen gradually becomes reduced in size, but it may take years before the *ague cake* entirely disappears. When the heart valves or kidney tissue are damaged, the prognosis is tempered in accordance with such and other possible complications. The mortality of malaria in malarious districts with a considerable population is large. Thus, Professor Celli says that the mean mortality from malaria in Italy is about 15,000 victims annually, and that about 2,000,000 cases occur in Italy each year. As the mean duration of malaria is generally long, sometimes infecting the individual for years, the loss of labor and of production and the expense entailed in dealing with the disease amount to several millions of francs. Furthermore, Celli says that, owing to malaria, about 5,000,000 acres of land remain uncultivated, with a resulting large economic loss. According to the very accurate calculations of Ricchi, the Adriatic

Railway Company, with 1,400 kilometres of road and employing 6,416 men, spends on account of malaria alone 1,050,000 francs a year. In the Italian army, in the twenty years from 1877 to 1897, there occurred more than 300,000 cases of malarial disease. Finally, Celli says malaria annually costs Italy very large sums.

Treatment.—Quinine is a specific for malaria without any preparatory treatment. Ten grains twice a day may be given for three or four days, then ten grains once a day for three or four days, then five grains once a day for a week. It matters little when the quinine is given. It should be given in solution or in a wafer or compressed tablet, not in a *gelatin capsule*, which often passes unchanged through the intestines. It may be given in suspension with the compound elixir of taraxacum or fluid extract of licorice. Quinine may be given hypodermically by using the soluble salt, quinine and urea hydrochloride, in 5, 10, or 15 grain doses. The oleate of quinine and quinine suppositories are practically useless. The tannate of quinine lozenges are too weak to be of value as an antiperiodic. Certain precautions must be observed in the hypodermic use of quinine and urea hydrochloride, to avoid cellulitis, slough, or abscess. The solution is to be thrown deep into the subcutaneous tissue, no drop is to be allowed to fall on the skin in withdrawal of the needle, and the point of puncture is to be sealed with tincture of iodine or iodoform collodion.

Euquinine is not so bitter as the ordinary quinine salts, and is more readily swallowed by children and not so readily vomited. It is given in the same doses as the sulphate. "*Sweet quinine*" (saccharinate of quinine) has been recently introduced. It is of full strength (about the same strength as the sulphate) and is obtainable as a granulated powder or in the shape of compressed tablets. It is sweet to the taste. The author has used it in his hospital and private practice with uniform success.

When the paroxysms have subsided, the following combination is serviceable to prevent relapses:

℞ Quininæ sulph., Acid. sulphur. arom., Solut. arsenical. Fowl.,	āā, ʒj;
Syr. c. aurant.,	℥j;
Aquæ,	ad, ℥vj.

M. S.: A tablespoonful twice a day after eating.

Or,

℞ Warburg's tincture with aloes, ½ oz. every morning after breakfast.

Or,

℞ Quininæ sulph.,	ʒj;
Elix. taraxaci comp.,	℥ij.

M. S.: A teaspoonful twice a day after eating.

Or,

℞ "Sweet quinine,"	gr. v;
Acid. arsenios.,	gr. $\frac{1}{30}$.

M. S.: Take two powders a day.

Opium and *chloral* may be indicated to control nervousness, and stimulants, such as *alcohol* and *strychnine,* may be necessary. In the *comatose form* enteroclysis and cooling sponge baths and douches are to be used.

Inhalations of hydrofluoric acid have been used in chronic malarial disease and in cases in which a patient did not tolerate quinine at all, by Olivieri, an Italian physician (*Nouveaux remèdes*, October 8, 1902). *Methylene blue*, in ½ to 4 grain doses three times daily, has been successfully given in cases in which there was an idiosyncrasy to quinine. The administration of this drug is often followed by strangury, nausea, vomiting, and headache. Powdered nutmeg lessens the tendency to strangury. The urine turns an indigo blue. It may be valuable in hæmaturic and hæmoglobinuric fevers. Tincture of iodine, given internally in one to two drop doses, is recommended in cases of quinine idiosyncrasy. In protracted convalescence and in chronic malaria a change of air from seashore to mountain, baths, general massage, and active exercise are called for.

The *treatment* of the various sequelæ and complications of malarial disease presents no special points and will be found under separate headings.

ENTERIC FEVERS (TYPHOID AND PARA-TYPHOID FEVERS)

Definition.—Typhoid fever is an acute infectious disease due to the invasion of the *Bacillus typhosus* of Eberth, causing inflammation and ulceration of the lymph follicles of the intestine and swelling of the mesenteric lymph nodes and the spleen.

The chief symptoms presented during an attack are protracted fever, diarrhœa, tympanites, wasting, headache, insomnia, delirium, anorexia, prostration, and mental apathy. The disease is self-limited, and death occurs from asthenia, visceral complications, hæmorrhage, or perforation, followed by peritonitis.

The specific germ is not the only pathogenic factor, as it has been proved that in the latter stages of the disease other microorganisms play an important part, not only in determining the extent and character of the bowel lesions, but also in the production of general toxic infection.

Clinically, the disease is marked by fever and wasting, roseola, diarrhœa, abdominal tenderness, and tympanites, such symptoms being inconstant, however. The remote effects are inflammatory and degenerative changes in various organs and tissues. Enteric fever is common in early and middle life; it has a period of incubation of from eight to twenty-three days, during which time there is a feeling of weakness and lassitude. Family predisposition has been noticed; a second infection is rare. In the early stage of enteric fever the bacilli are found in the lymphoid tissue of the intestines, and afterward in the spleen, liver, kidneys, bone marrow, bile, and urine.

Modes of Infection.—**Ætiology.**—Enteric fever and Asiatic cholera are caused by swallowing food and drink contaminated by the discharges of previous cases. Milk contaminated with enteric fever water may carry the infection, also raw oysters taken from contaminated water. The *Bacillus typhosus* is not destroyed by freezing, and may be conveyed by means of ice. Uncooked vegetables may carry the infection, and in all probability the common house fly is occasionally the vehicle of its transmission.

Prevention of the Spread of Enteric Fever.—In order to reduce the danger of infection to a minimum we must secure pure water and good drainage; isolation of the sick; and disinfection of urine, fæces, and their receptacles, soiled linen, soiled hands of the nurse or attendant, and soiled thermometers.

Drinking water is the chief source of infection. One single case may prove the starting point of an epidemic. Enteric fever germs live a long time in water and soil. The influence of abolition of urban wells and the introduction of sand filtration of drinking water on the mortality from enteric fever is graphically shown by the accompanying chart, taken from the *New York Medical Journal*, November 29, 1902.

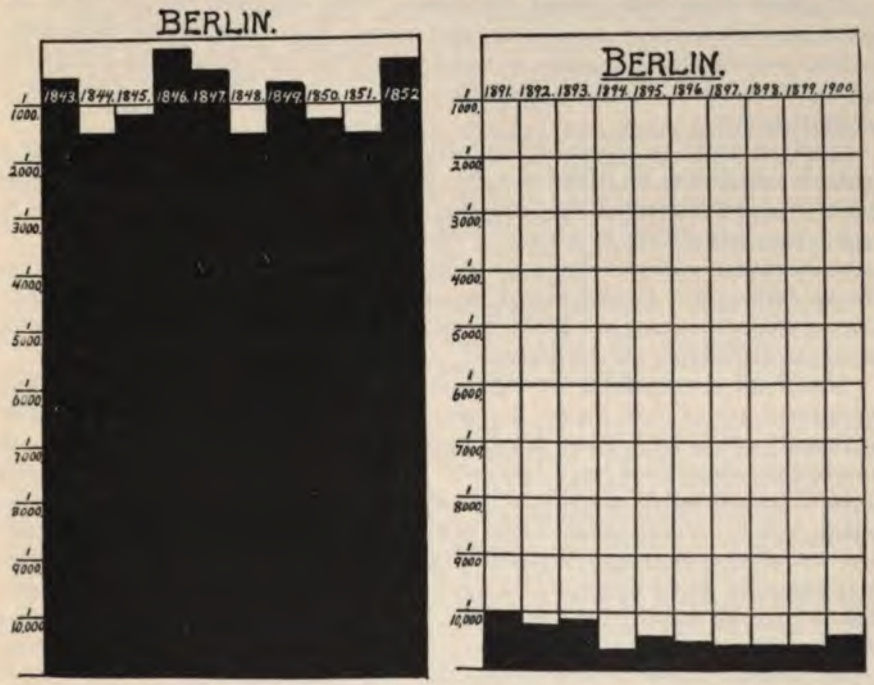

Fig. 207.—Typhoid Fever in Berlin Before and After Sand Filtration of Drinking Water (Seibert).

"On passing to the influence of sand filtration of drinking water on typhoid mortality, we again find in the experience of Berlin the most conspicuous example, for instead of one typhoid death in every 900 inhabitants annually from 1843 to 1853, this city lost but one person out of every 9,000 of typhoid annually from 1883 to 1893, although not all of the city's wells had been closed and the supply of filtered water from the old waterworks (installed in 1853) had become insufficient on account of the rapid growth of the city. But when, about 1892, the new waterworks which could supply 2,500,000 inhabitants with pure, filtered water, were completed, this mortality was promptly reduced to one in 50,000, although the population of Berlin had increased from 400,000 in 1853 to 2,000,000 in 1890." (Seibert.)

If the typhoid germ is transmitted to persons in close connection with the patient, only *isolated* cases occur (infection by contact). The preparation, storage, and sale of provisions in or near rooms occupied by typhoid patients should not be allowed, and typhoid patients should be transported in ambulances which can readily be disinfected. If the germs are transmitted to articles in general use, such as milk and water, epidemics may arise.

Typhoid Fever from Rural Districts.—"The ordinary farmer, with the 'moss covered bucket' and clear well water, is not always to be trusted as an expert sanitarian, nor is he apt to volunteer any information concerning the fever cases that have occurred either in his own house or in that of his neighbor.

"An old well is always a menace, and when it becomes poisoned it is next to impossible to make it safe afterward. Even brooks take a long while to cleanse themselves, and the microorganism has been known to exist over eighty days at a time in filter sand.

"Defective surface drainage quite naturally prolongs the period of chance infection. *Contaminated manure* is also a factor, and salads and other garden produce are likely to be the vehicles for the conveyance of the germ directly to the consumer."

Under all circumstances a rigid and frequent inspection of dairies and the households of dairymen is a necessity, and wells which have been contaminated by enteric fever discharges should be closed up. As regards *personal prophylaxis*, it may be stated that the individual can best protect himself in an infected district by drinking water and milk which have been boiled and by remembering that *raw oysters* may carry the infection and that *air-borne* contagion is a possibility, inasmuch as germs may be diffused in the dust of dried excreta and light on milk, meat, and vegetables, and that it may be carried by flies which have found access to the excrement of typhoid fever patients. Persons travelling by railroad or boat should not drink unboiled water or milk unless they are sure of its purity.

The importance of the disinfection of the urine, fæces, sputum, and bed linen cannot be overestimated, for it strikes at the root of the evil. Persons afflicted with typhoid fever should never use closets. All excretions (from bowels, bladder, or stomach) should be retained in easily cleansed vessels and never thrown into closets or manure heaps before being disinfected. They should be rendered innocuous by means of lime milk or chlorinated lime or diluted carbolic acid before being removed. In cases of emergency, if no disinfectants are at hand, the excrements can be buried in places far removed from drains, pumps, and buildings, where infection is not to be feared. Special care must be taken not to carelessly throw excrements away or soil the floor, clothes, etc., not even with traces of the excrements.

Special attention must be given to the sputum of patients in order to render it innocuous. Handkerchiefs and cloths which were used must be placed for at least one hour in diluted cresol or boiled in water before being sent to the laundry.

For catching the sputum and wiping the mouth and nose, it is best to use gauze cotton rags, which must be disinfected after use or burned.

The evacuations and urine of typhoid patients should never be thrown near pumps or drains, where water for drinking and other purposes is taken; the vessels after being emptied should never be cleansed at places from which water is supplied or taken. Water used for washing and bathing typhoid patients can also cause infection. It must therefore be rendered innocuous and must not be poured away near drains and pumps. If possible, it should be made innocuous by an addition of chlorinated lime before removal, in order to prevent all infection.

Attention must be paid to the fact that the evacuations of persons who have had typhoid fever, and who are already convalescent, yet contain infectious germs for a long period. Such persons must be treated as if they were still ill, as far as disinfection is concerned, until the physician declares that infection is no longer to be feared.

Treatment of Body and Bed Linen, Clothes, and Other Articles of Use.—All washable clothing, such as body and bed linen and washable parts of clothing, should remain at least one hour in diluted solution of cresol or boiled in water before being sent to the laundry. Articles of clothing used by typhoid patients, which cannot be washed, should be disinfected with steam in a disinfecting establishment if possible. If this is not possible, they should be well brushed with diluted water of cresol. All eating utensils (plates, cups, glasses, spoons, forks, knives, etc.) used by typhoid patients should be thoroughly cleansed with hot soda solution before being used by other persons.

The Symptoms of Enteric Fever.—The prodromal symptoms, extending over a week or ten days, are loss of appetite, nausea, vague pains, faint rigors, and diarrhœa or constipation. There is a steady rise of temperature, and toward the end of the first week a rash appears on the abdomen, chest, back, or extremities, which is rose-colored, not elevated, and disappears on pressure (roseola). The spleen may or may not be enlarged.

In the second week the fever becomes higher and the pulse more rapid (110). The mouth, throat, and lips are dry, the tongue has a brown coating, and the face has a dull expression. Ileocæcal gurgling, tympanites, diarrhœa, and abdominal tenderness are present in pronounced cases, and symptoms of disorder in the nervous and respiratory system are noticeable.

In the third week the temperature and pulse are quite high (pulse 120 to 130), with a morning remission and a tendency to decline. The abdominal symptoms are pronounced, and hæmorrhage or perforation of the bowel is not infrequent.

About the end of the third week or beginning of the fourth week convalescence usually sets in, but severe cases often drag on to the fifth, sixth, and even the twelfth week. The fall of temperature is gradual; the evening temperatures are 1° to 2° higher than the morning temperatures. In rare instances the fever type is inverted, the high temperature being noted in the morning.

THE FEVER OF CONVALESCENCE.—After the temperature has been normal for several days there may be a sudden rise to 102° or 103°, with a drop to the normal within a day or two. This is generally due to constipa-

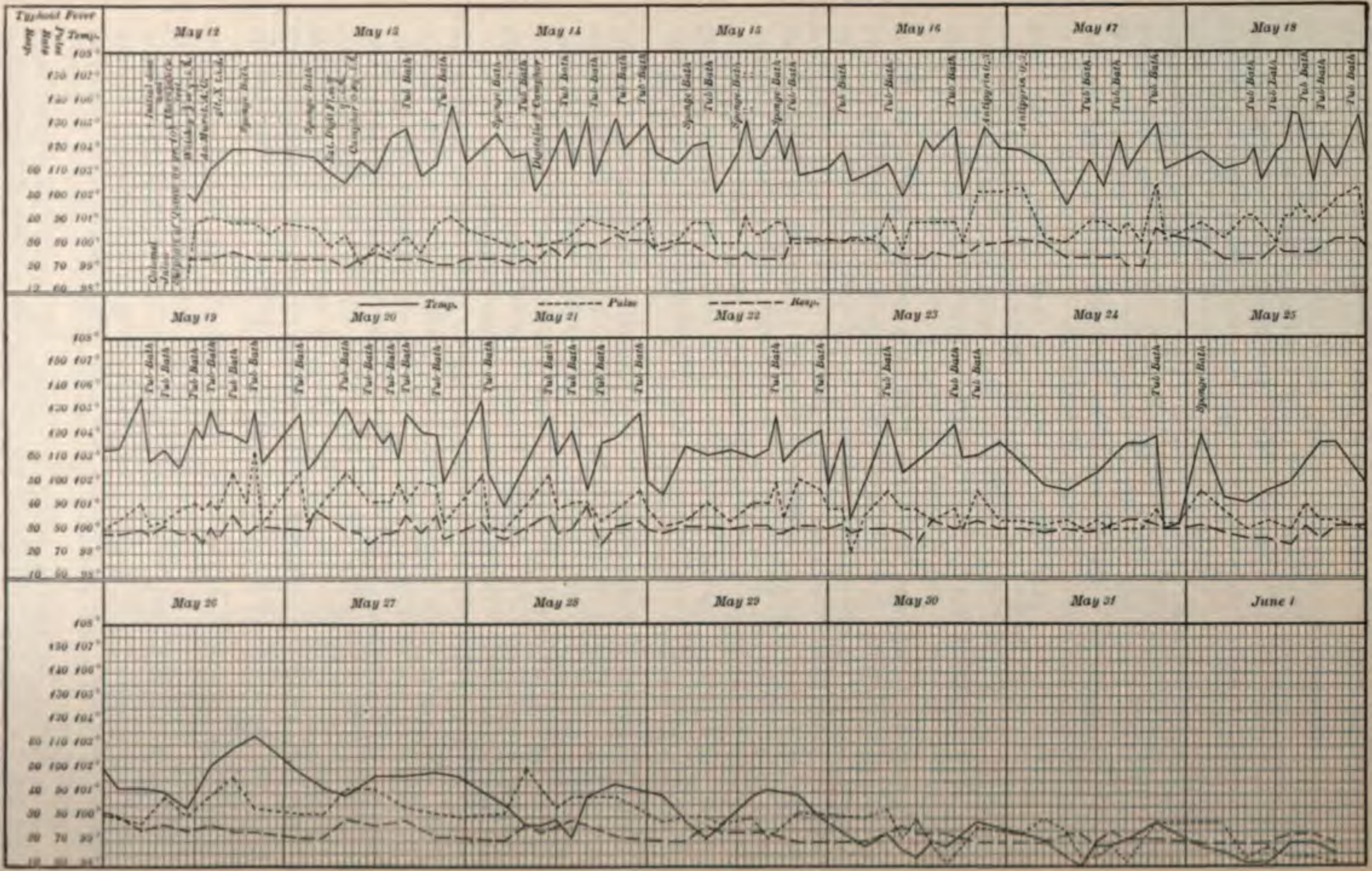

FIG. 208.—PULSE RESPIRATION AND FEVER CURVE IN UNCOMPLICATED TYPHOID FEVER.

tion or indigestion and necessitates a careful clinical inquiry as to possible complications.

THE FEVER OF RELAPSE is similar to that of the original attack, though generally but not always milder, and may persist for weeks.

RESPIRATORY SYMPTOMS in enteric fever are rapid breathing, bronchial moist râles, and other signs of acute bronchitis.

CIRCULATORY SYMPTOMS.—In the beginning the pulse is usually dicrotic. When the heart sounds become feeble, a soft systolic murmur may be heard over the heart.

GASTRIC SYMPTOMS.—A coated tongue with red edges and loss of appetite are generally observed. Sordes collect upon the teeth. Nausea and vomiting are not frequent.

INTESTINAL SYMPTOMS.—Abdominal tenderness, tympanites, and ileocæcal gurgling are usually present. Whether diarrhœa or constipation is present depends upon the situation of the intestinal lesion. The pea soup stools are characteristic.

NERVOUS SYMPTOMS.—Headache, mental torpor, muttering or active delirium, subsultus tendinum, stupor, and coma may be present.

OTHER SYMPTOMS.—*The blood* shows a reduction of the hæmoglobin index, a lowering of the number of red corpuscles, and no leucocytosis.

The urine is high colored and often there is retention. Ehrlich's diazo reaction is frequently observed. The urine may contain albumin, tube casts, blood, and great quantities of typhoid bacilli.

The skin may be hot and flushed or moist, pale, and slightly cyanotic in circulatory failure. Roseola, erythema, and sudamina are generally to be seen.

The eyes are often injected and the pupils are generally dilated. *Hearing* is usually dull.

Diagnosis of Enteric Fever.—The diagnosis is based on the clinical symptoms, the peculiar temperature curve, the presence of rose spots, the positive Widal reaction, the absence of leucocytosis, the positive diazo reaction, and the failure of the blood test and therapeutic test for malarial infection. In a certain number of cases the Widal test remains negative, and all the clinical evidences of enteric fever are present. Such cases are explained on the assumption of a *paratyphoid fever*, due to bacillary infection not of the Eberth bacillus variety.

DIFFERENTIAL DIAGNOSIS.—*Diseases Simulated by Enteric Fever.*—A localization of the enteric fever poison in the meninges may simulate *cerebrospinal meningitis;* a localization in the kidneys gives symptoms of *acute nephritis;* a localization in the lungs may simulate *acute lobar pneumonia.* A positive Widal reaction and the presence of other clinical manifestations of enteric fever will set us right. The distinction of malarial remittent and enteric fever rests upon the following points: In *remittent malarial fever* we often find herpes labialis, the pulse is rarely dicrotic, there are no rose spots, and the abdominal symptoms are not marked. In about seven days after the onset of the disease the plasmodia should be abundant in the blood and the administration of quinine will influence the fever, while the Widal reaction will be wanting. A double infection of enteric fever and plasmodium fever is theoretically spoken of as *typhomalarial* fever.

Simple Continued Fever.—A fever of gastric or intestinal origin may last for seven or eight days and simulate enteric fever. The blood and urine reactions, the therapeutic quinine reaction, the clinical symptoms, and the roseola of enteric fever are absent.

The *æstivoautumnal variety* of malarial fever may simulate enteric fever.

Acute miliary tuberculosis will show an irregular fever and a more rapid respiration and pulse. The therapeutic and blood tests will be negative. The diazo reaction is occasionally observed in tuberculosis. Tubercle bacilli may be found in the sputum.

Tuberculous peritonitis, salpingitis, and catarrhal enteritis may be mistaken for enteric fever. The Widal test should be applied, and a local examination and the absence of clinical symptoms of enteric fever will lead us to a correct diagnosis.

Appendicitis may simulate enteric fever, the latter may simulate appendicitis, and appendicitis may complicate enteric fever. The abrupt onset, a careful local examination, and the absence of the Widal reaction will establish the correct diagnosis.

In *subacute ulcerative endocarditis*, which may be mistaken for enteric fever, we observe recurrent chills, an irregular fever type, and endocardial murmurs, whereas rose spots, abdominal symptoms, and the Widal reaction are absent.

Influenza is rarely mistaken for enteric fever. The absence of the Widal reaction and the finding of the influenza bacillus in the sputum will lead to the correct diagnosis.

Uræmia of a subacute or chronic type, with slight rise of temperature, stupor, and a rapid pulse, may be mistaken for enteric fever. In the absence of a rose rash and the Widal reaction, and with positive urinary findings, the distinction should not be difficult.

Trichiniasis has been diagnosticated as enteric fever on account of the fever, delirium, abdominal pain, and diarrhœa. In trichiniasis the Widal reaction is absent, the eyelids are swollen, the muscles are swollen and painful, and trichinæ may be found in excised muscle tissue.

In *typhus and relapsing fevers* the onset is sudden and the defervescence is critical.

The Clinical Varieties of Enteric Fever.—1. The mild form. All the symptoms are mild, the temperature does not go above 103°, and the disease does not generally last more than two weeks.

2. The ordinary form, without special or severe complication, has been described under "symptoms," and a typical case is illustrated by the fever chart.

3. The abortive form lasts about two weeks and terminates with considerable sweating.

4. The latent, or walking, typhoid (ambulatory typhoid). The symptoms for the first two weeks may be exceedingly mild, and the afflicted person is able to attend to work, but is eventually compelled to go to bed.

5. The grave, or severe, form. The fever is high (105°) and may persist for five, six, seven, or eight weeks. Most of the classical symptoms of enteric fever are present and severe.

6. Enteric fever in the aged shows a lower fever range and more pronounced cardiac, pulmonary, and renal complications.

7. In the so called hæmorrhagic typhoid the purpura and the hæmorrhagic diathesis occurring during the course of enteric fever are secondary and associated with septic complications. These cases are not to be confounded with cases of intestinal hæmorrhage occurring during the course of enteric fever.

8. Finally, it may be emphasized that persons may have typhoid bacilli in their stools *without symptoms.*

9. Paratyphoid fever. The Widal reaction is absent, while from the blood is obtained a bacillus intermediate in type between the typhoid and the colon bacillus. The *paratyphoid* bacillus may be defined as a member of the intermediate group which produces typhoidal symptoms in man. The fever is usually mild. The number and frequency of the complications form a striking feature of the disease. The surest way of making the diagnosis is to cultivate the paratyphoid bacillus from the blood of the suspected case. But if the organism cannot be recovered from the blood, urine, fæces, or some localized lesion, the diagnosis is justified, in the light of our present knowledge, if the blood agglutinates a paratyphoid bacillus in high dilution and fails to agglutinate the typhoid bacillus or agglutinates it only in very low dilutions. There are two kinds of paratyphoid bacilli, A and B, and the blood should be tested with both, as in some cases a negative reaction will be given with one and a positive reaction with the other.

10. Typhoid fever in children usually runs a milder course than in adults.

Prognosis.—The disease is self-limited. The mortality varies from 5 to 15 per cent. When death occurs it is usually due to circulatory failure, hæmorrhage, perforative peritonitis, or some other complication.

Pregnant women are liable to abort during typhoid fever.

Valvular heart disease adds to the gravity of typhoid infection.

Treatment of Typhoid Fever

The patient must be put to bed and isolated, and all precautions mentioned in the chapter on Prophylaxis and Disinfection must be taken.

The value of antitoxic serum as a prophylactic and curative agent is not as yet established. Before the diagnosis is certain an adult patient may take one dose of quinine and calomel, 10 grains each, to be followed by a saline cathartic.

Daily flushing of the lower bowel with soap suds or a warm saline solution is indicated as a routine procedure except in peritonitis.

Diet.—The diet must be fluid and supply fuel to prevent tissue waste. It must be readily digestible, leaving but little residue to mechanically injure the diseased bowel, *which is always affected in this disease.*

Specimen Diet.—Milk with lime water or with Vichy water; white of egg in water (whites of two eggs to one pint); eggnog; gruel, oatmeal and barley; burnt flour gruel (in diarrhœa); ice cream, water ices, blanc mange, custard; pea, rice, beef, chicken, and tomato soups; tropon in mint tea, buttermilk, matzoon, cream and coffee, milk and tea, cocoa, ginger ale, whiskey, pineapple and orange juice, cold water in abundance. (See also Fluid Diet.)

When milk disagrees with a patient and *whenever the abdomen becomes markedly tympanitic*, the use of milk should be discontinued.

Liquid diet should be adhered to until the temperature has been normal for a week, after which soft diet may be allowed. (See Soft Diet.)

To aid digestion, 5 drops of *dilute hydrochloric acid,* in water, should be given after each feeding.

Competent nursing will prevent *parched lips, foul tongue, sordes,* and *bedsores.* In uncomplicated cases of typhoid fever *medication is unnecessary.* The so called intestinal antiseptics are useless or harmful, and antipyretic drugs are of doubtful value. The best intestinal antiseptic is bowel action.

Hydrotherapy.—The sponge bath is a convenient procedure in private practice. The patient is sponged on a blanket. Considerable friction is applied, and the temperature of the water may range from 70° to 60° F.

Cold water may be applied by means of a moist compress placed around the chest or over the abdomen. Such applications may be changed every hour or two. When a moist cold compress is placed so as to envelop the body, we speak of a *sheet bath.* Cold water may be poured onto the sheet while friction is applied.

A full bath, or "tub," is best given by placing the patient in water of from 85° to 90° F. and gradually reducing the temperature to 80° and 70° F. while friction is applied. A full bath at 70° is for robust people. Children, the aged, and the weak do not take kindly to a cold bath.

By hydrotherapy we attempt to bring on a reaction to equalize the circulation and to promote elimination.

Treatment of Complications and Sequelæ

Pain and Tympanites.—Discontinue milk, apply hot turpentine stupes to the abdomen, use a rectal tube to aid in expelling gas, and give a soap suds enema. Give turpentine emulsion internally.

℞ Spir. terebinth.,
Spir. lavandul. co., } āā, ... ʒj;
Pulv. gum. arabici, ... ʒij;
Syrup., ... ʒjv;
Aquæ, ... ad, ℥jv.

M. Sig.: A teaspoonful every two hours until the patient is relieved.

Codeine may be given to relieve pain.

Diarrhœa.—Loose stools are the rule in typhoid fever. In case of an active diarrhœa, the use of milk should be discontinued and the diet should consist of egg, barley gruel, burnt flour gruel, and pea soup. The patient may take a teaspoonful of paregoric or bismuth, gr. xv, and opium, gr. ¼, or tannin, gr. v, and opium, gr. ¼, or

℞ Bismuth, subcarb., ... ʒj;
Extr. krameriæ fluid.,. .... ʒj;
Aquæ, ... ℥jss;
Syrupi, ... ʒjv.

M. S.: A tablespoonful several times a day.

Constipation is readily overcome by means of an enema or a saline laxative.

Retention of urine must be relieved twice or three times a day by means of a *clean* catheter.

Nervous symptoms and psychoses are best controlled by the usual hydrotherapeutic measures. An ice cap and a cold pack may be applied, and chloral hydrate and potassium bromide be administered by the mouth or per rectum, also morphine, gr. $\frac{1}{8}$ to $\frac{1}{4}$, or hyoscine, gr. $\frac{1}{100}$, may be injected hypodermically or given by the mouth. *Tetany* is a rare complication.

In the event of **hæmorrhage from the bowel** or elsewhere, absolute rest is imperative. Opium, gr. $\frac{1}{2}$, morphine, gr. $\frac{1}{8}$, acetate of lead, gr. ij, or tannin, gr. v to x, may be given several times a day. One or two ice bags are to be placed on the abdomen and bowel irrigation must be discontinued.

In **circulatory failure** we adopt timely stimulation by means of whiskey, champagne, strychnine, camphor, digitalis, and enteroclysis at 110° F. (See General Therapeutics.)

Venous Thrombosis.—In peripheral thrombosis with phlebitis, rest and an ice bag over the seat of inflammation are indicated. In septic phlebitis pus and ichorous fluid must be evacuated by the knife. Ultimately massage is useful to overcome local œdema. In *pericarditis* and *septic parotitis*, mastitis, and orchitis, laxatives and an ice bag are indicated.

Periostitis with bone necrosis and pyothorax are to be treated surgically.

Pneumonia, pyelitis (pyuria), gangrene, bedsores, and the typhoid spine are among the many complications observed in typhoid fever. Perichondritis of the larynx is comparatively rare. Baldness, temporary or permanent, after typhoid fever is not infrequent. Hair cutting and shaving the scalp have no marked influence in preventing baldness. Convalescents require tonic management in restful surroundings.

Perforation and Peritonitis.—Perforation of the intestine is usually fatal. It occurs in about 2 per cent of all cases. It is announced by a sudden severe pain, usually in the right iliac region, accompanied by symptoms of collapse and followed by abdominal distention and peritonitis. The site of perforation is usually in the last twelve inches of the ileum, and when such complication is recognized, the patient must be stimulated and prepared for an operation if the circulation is not absolutely bad.

INFLUENZA

Definition.—Influenza is an acute infectious disease due to the invasion of a specific bacillus. It is a disease of very rapid extension and wide distribution, and usually occurs in epidemics. The bacillus is small, nonmotile, and found in large numbers in the nasal and bronchial secretions. There is a short period of incubation, varying from twenty-four to seventy-two hours.

Symptoms and Clinical Varieties.—The onset is usually with fever and is abrupt; the subsequent course of the disease depends upon the type it follows: *Respiratory*, *gastrointestinal*, *nervous*, or *febrile*.

In the RESPIRATORY type the onset occurs with a catarrhal inflammation of the mucous membranes, accompanied by severe prostration. The inflammation may involve only the nasopharynx, extend to the larynx or bronchi, or involve the lung tissue itself. If the lung tissue is involved, it is usually in a small area or in the form of a lobular pneumonia. There may occur, however, a lobar pneumonia, due to this bacillus. Pleurisy is a very rare condition as a primary inflammation, but it is associated with pneumonia. Empyema frequently follows a pleurisy of this type. Preceding tuberculous inflammation of the lung is aggravated by influenza, and the damage to the lung tissue by severe influenza frequently produces a fertile soil for subsequent tuberculous infection.

When the GASTROINTESTINAL tract is involved, there may be nausea and vomiting, together with diarrhœa, as the fever sets in. These symptoms may be very severe and be accompanied by collapse. Abdominal pain is often the most severe complaint. Jaundice may occur when the inflammation of the mucous membrane of the duodenum and common bile duct causes obstruction to the escape of bile. Enlargement of the spleen will depend upon the duration and intensity of the infection.

NERVOUS TYPE.—The infection may be ushered in with severe headache, pain in the back and joints, and marked prostration, but no catarrhal inflammation. Later the meninges and brain substance may be involved by the infection and an abscess may develop. The sequelæ of such an infection may be only mental and nervous depression, or develop into melancholia and dementia. This is not a frequent type.

The FEBRILE TYPE may simulate typhoid fever by continuing for several weeks. There may be remissions with chills, so that malaria may be thought of. Herpes is a common association, while iritis, otitis, endocarditis, phlebitis, and orchitis are less common. Nephritis may develop and be severe or become chronic. Of all these types the catarrhal, affecting the respiratory system, is the most common, but the other types should not be forgotten or overlooked.

The **differential diagnosis** is easy when the disease is pandemic. But the prostration, out of all proportion to the intensity of the disease, is the most characteristic feature to be remembered. The presence of the bacillus in the sputum is diagnostic, but such discharge is not present in all types. This point can be depended upon only when the disease is of the first type.

The **treatment** should be that of all infectious diseases—by isolation, confinement to bed during the period of fever, and good, intelligent feeding, i. e., with liquid and soft diet, and hydrochloric acid to aid digestion. The bowels should be early and thoroughly opened with calomel or salines. In the early stages the old treatment with a warm bath, confinement to bed, and hot drinks does great good and frequently gives immediate relief.

If the temperature is high or there is delirium, the coal tar drugs may be used, but guardedly, because of their depressing effect upon the heart. The ice cap is always useful. Cardiac stimulants (see Stimulants) may be required and should then be given. Elixir of strychnine, quinine, and iron is excellent during convalescence. Prolonged rest and change of climate may be required in some cases to restore the patient to his former health.

Influenza in Children.—Out of 2,460 examinations of cultures made by the Chicago health board from the throats of persons suspected to have diphtheria, 677 showed the Pfeiffer influenza bacillus to be the only pathogenic organism present. The catarrhal type of influenza is the one most frequently met with in children. The nervous, circulatory, and febrile phenomena in influenza are due to the blood intoxication. Children of any age are susceptible to influenza infection. Relapses during convalescence are quite common, and grave sequelæ are frequent. The *treatment* is purely symptomatic, as in other infectious fevers. Sodium benzoate or phenacetine may be given in two grain doses several times a day to restless children.

YELLOW FEVER

Definition.—This is an acute infectious disease characterized by severe toxæmia, jaundice, albuminuria, and a pronounced tendency to gastric hæmorrhages.

Ætiology.—The specific bacillus has probably been isolated by Sanarelli, though this is as yet disputed.

All races and ages are liable to the disease, though the negro is less susceptible. Residents of localities where the disease prevails are less susceptible than strangers. Crowding, bad drainage, lack of proper ventilation, and hot seasons especially favor epidemics.

The infection is disseminated by the excreta *and by mosquitoes,* which carry the blood and inoculate those who are subsequently attacked. Those infected with the disease show in the blood an agglutinative reaction to the bacillus of Sanarelli as early as the second day. This fact may be used as a means of diagnosis, and it also tends to demonstrate that the bacillus is the specific germ of the disease. Immunity is acquired by one attack of the disease, but probably not by heredity.

The incubation period may be as short as twenty-four hours, though it usually varies from three to four days. Rarely does this period extend to seven days.

Symptoms.—The onset, as in all acute infectious diseases, is sudden, with headache, backache, and chilly sensations. The fever rises rapidly, with a hot dry skin. The tongue is coated and moist and the throat is sore. Nausea and vomiting accompany the onset and the vomiting increases in intensity on the second and third days. The bowels are usually constipated.

With the onset the face is flushed more than in other acute diseases and the conjunctiva is bright red in color. This injection of the capillaries, together with jaundice, is the most characteristic feature of the disease. After the onset the temperature usually varies between 102° and 103° F., and will remain so for the first day. Extremes of temperature are between 100° and 106° F. By the end of the third day defervescence may begin in mild cases, preceded by lysis of two or three days' duration. This stage of calm is succeeded by a secondary fever of one, two, or three days' duration; then there is a short lysis, and convalescence begins.

The *pulse* at the outset is rarely over 100 or 110, but on the second or third day, while the rise of temperature persists, the pulse becomes slower and may even fall twenty or more beats. During defervescence the pulse may fall to thirty. This slowing of the pulse, with a high or rising temperature, is another feature of the disease.

By the third day *albumin* appears in the urine, especially that voided during the latter part of the day. In severe cases the albumin appears on the first or second day, and the amount is large, with casts and all the other signs of acute nephritis. The patient may die of suppression of urine, in convulsions or coma.

From the onset vomiting is present and consists of the stomach contents, then of mucus, and then of a grayish fluid. In the second stage the vomiting is more continuous, and in severe cases is characterized by the presence of *blood.* It is this blood which gives the name "black vomit," a feature of the severe cases, though not necessarily fatal. Small cutaneous hæmorrhages or bleedings from the mucous membranes may be present. Black, tarry stools result from the presence of blood. As a rule, the mind is peculiarly alert, though there may be, in very severe cases, an active delirium from the onset. In some cases the first mental change may mark the onset of uræmic convulsions or coma.

Diagnosis.—Yellow fever is to be distinguished from dengue and malarial fever of a severe type, and the distinction is usually easy if an epidemic exists.

The **prognosis** varies with the epidemic. The mortality varies from 10 to 85 per cent. Favorable signs are a low temperature, slight jaundice, absence of hæmorrhage, and the continued secretion of urine.

The **prophylaxis** is to exclude possible sources of infection, isolate cases, disinfect all excreta, and institute proper hygiene in infected districts. A notable instance of what proper drainage and attention to other details of the health of a city can accomplish is to be found in Havana under the recent changes there consummated.

Treatment.—The *immediate treatment* of the disease depends on good nursing and proper relief of symptoms, though a cure by blood serum injections may at any time be perfected.

Comfortable, airy, and well but not brightly illuminated rooms, wards, or tents are to be preferred. The feeding by the mouth should be with very small amounts of fluid, but if vomiting is severe feeding by the mouth should not be attempted. Resort to rectal feeding and irrigation if vomiting is continuous. The withholding of all food in the early stage is probably the preferable method in severe cases, and administering rectal saline enemata to allay the thirst. Small pieces of ice may be given by the mouth. For the pain, morphine may be required. If the temperature is high, bathing is the best method of treatment. Hot baths are to be used for the uræmic conditions if they develop. Cardiac weakness may require stimulants. Complications are to be met with the appropriate treatment as they arise.

TYPHUS FEVER

Definition.—This is an acute infectious disease, characterized by a sudden onset, a macular rash, and marked nervous symptoms, and terminating by crisis at the end of two weeks.

Symptoms and Course of the Disease.—It is very contagious and few escape who are exposed. Crowding and poor food seem to increase the liability to infection. The virus of the disease has not yet been discovered.

The *incubation* period of the disease varies from twenty-four hours to twelve days; seldom or never is it over three weeks.

The *invasion* is abrupt, with a chill, fever, headache, pain in the back and legs, and early prostration. The tongue is dry, furred, and white; the face is flushed and the expression dull and stupid; the eyes are congested; the temperature is high and may be higher on the second or third day; the pulse is full and frequent, seldom dicrotic; and the respiration may or may not be hastened. Vomiting may be present, though it is not common. Constipation is usual, though diarrhœa may occur. The mental symptoms appear early, and in severe cases may amount to violent delirium, worse at night. During the second week the delirium is usually of the active, noisy variety. The eruption appears at any time from the third to the fifth day, first upon the trunk and then upon the extremities. In two or three days the rash is all out, and the earliest subcuticular mottling has changed to distinct rose colored papules, and these in turn to petechial areas not affected by pressure. In the early grouping and appearance, the rash may *resemble measles* or the early *rash of syphilis*.

The fever rises with slight remissions for four or five days, reaching the maximum of 105° to 106° F. about the fifth day. In mild cases the maximum may never be above 103° F. Preceding the fatal termination, the temperature may rise to 108° F. or higher. Ordinarily, after the fastigium, the fever continues with only slight remissions until the twelfth or fourteenth day, when it ends abruptly by crisis. Early in the disease there is a soft systolic murmur at the apex with an inaudible first sound. The pulse is frequent and feeble. In the second week the frequency may be as high as from 150 to 160 to the minute, while the heart sounds resemble closely the fœtal rhythm. The dusky hue of the face shows the impaired circulation.

During the second week all the symptoms become greatly aggravated, especially those arising from the cerebrum. The prostration is much more marked, the patient lying upon the back, with a dull, expressionless face; the cheeks dusky or flushed, the conjunctiva injected, and the pupils contracted. Frequently there is coma vigil, with subsultus tendinum and picking at the bedclothes. The tongue becomes dry, brown, or black and cracked—the so called "parrot-tongue" of typhus. The normal ratio of pulse and respiration is not usually altered, unless there are complications or the delirium is unusually active.

In the favorable cases the temperature falls on the fourteenth day and the patient passes into a quiet sleep which leaves him with a clear mind. A profuse clammy sweat at this time is usually a bad sign, showing a severe grade of prostration.

Convalescence is usually rapid and relapses are very rare. The congestion of the lung to a more or less marked degree is a common feature of severe cases. Pneumonia is the most frequent complication. The urine shows an increase of the urea and uric acid; the chlorides are diminished; albumin is present, but rarely nephritis. There may be hæmaturia.

There are malignant cases which terminate in a few hours or in two or three days. Contrasting with these are the mild cases sometimes seen in epidemics.

Complications.—*Pneumonia* is usually of the bronchial type. Gangrene may occur, and it is fatal. In children cancrum oris, or infection of toes, hands, or nose, may occur. Meningitis is rare, while subsequent paralysis is not uncommon. Septic processes, in addition to those mentioned, may occasionally happen. Nephritis is uncommon, while hæmaturia is more frequent.

Prognosis.—In the young, about 12 to 20 per cent of the cases are fatal, while after middle age the mortality is about half. In the second week death is usually due to the toxæmia, while after that period death is generally caused by a complication, most commonly pneumonia.

Diagnosis and Differential Points.—*Diagnosis* is extremely difficult, except during an epidemic. The Widal reaction, if present, establishes the diagnosis of *typhoid fever*. *Hæmorrhagic variola* may resemble typhus, but the hard, shotty area may help to distinguish it if the distribution of the initial rash does not.

Cerebrospinal meningitis must be thought of, but spinal puncture and the character and distribution of the eruption will help to distinguish the one from the other.

Measles has a brighter rash, and its appearance is preceded by catarrhal symptoms.

Syphilitic eruptions occur with slight fever or none at all, and the history of chancre.

The **treatment** of typhus should be the same as for typhoid fever—comfortable, airy quarters with an easy bed and competent, skilled nurses. The feeding should be at regular intervals, and the food should consist of milk, eggs, broths, and gruels. Peptonized preparations may also be used when the digestive power is weak. Water should be administered in good quantities, to allay the thirst and help to reduce the fever and dilute the toxines in the blood, thus aiding in the excretion of them.

Alcohol should be used, as in typhoid fever, to conserve the energy of the patient. The good effect will be seen by the action of the heart becoming slower and more forcible; by the delirium or nervousness growing less active; by the tongue becoming moist and cleaner; and by the sleep being of longer duration and more tranquil.

Cold baths should be used on the same indications as in typhoid fever, to reduce the temperature and act as a tonic to the circulation and the nervous system.

Camphor, strychnine, caffeine, and *digitalis* should be used as indications require. The intestinal tract should be cleared with mild cathartics at intervals.

Complications require the treatment directed to such conditions.

DENGUE

This is an acute infectious disease, characterized by fever, pain and swelling of the joints, and an erythematous eruption.

Ætiology.—The cause of the disease is not known, though a micrococcus and a hæmatozoon have both been given the credit. Tropical and subtropical countries are most affected by epidemics, and these are very rapid in diffusion. Because of its frequency in places where, and at seasons when, the mosquito is most numerous, the culex is believed to be the vehicle of the infection.

Symptoms.—After an incubation period of from three to five days, the onset is sudden, with headache, intense joint pains, and pain in the muscles. There may be a chill. The temperature gradually rises and may reach 106° or 107° F. The pulse becomes frequent with the high temperature. The face is bloated and suffused, while the mucous membranes are injected. The conjunctiva is especially notable for the injection. The usual concomitant symptoms of infectious fevers are present, viz.: loss of appetite, a coated tongue, constipation, and a diminished amount of urine. The joints are successively involved and become swollen, red, and painful, but do not suppurate. Hæmorrhage from the mucous membranes and black vomit have been noted in some epidemics.

About the third or fourth day the fever reaches the maximum, and then follows a period of from two to four days of apyrexia. During this period the patient is prostrated out of all proportion to the severity of the fever. Following the apyrexia, another attack of high temperature, with return of all the joint symptoms, occurs. Accompanying the attacks there are various eruptions, but none distinctive—macular, papular, scarlatiniform, urticarial, or vesicular. The usual duration of the disease is seven or eight days, and it is followed by mental and physical depression of a severe nature.

Diagnosis.—In epidemics the diagnosis from rheumatism and yellow fever is not easy, even when all the symptoms are closely observed. The agglutination test for yellow fever, if positive, is of diagnostic importance.

In the **treatment** there is no specific as yet, though serum therapy may in the near future give us an antitoxine. Relief of pain with opium or morphine, careful nursing, fluid diet, and hygiene are the elements of treatment, with tonics and stimulants in convalescence.

RELAPSING FEVER

Definition.—This is a specific infectious disease caused by the spirochæte or spirillum of Obermeier and characterized by a febrile paroxysm of six days' duration, followed by a remission of about the same duration, then a second febrile attack and a remission. There may be three or four remissions or only one.

The disease is very contagious, but how it is conveyed is unknown. Overcrowding and poor food dispose to the disease, while age, sex, and season are not factors. One attack does not confer immunity to a second attack.

The spirochæte is found in the blood during the fever. It varies in length from three to six times the diameter of a red corpuscle. It is a narrow, spiral filament, active and readily found during the paroxysm. During the remission bright glistening bodies are found in the blood, but whether these are spores or specimens of destroyed spirochæte is yet disputed.

The incubation period is supposed to vary from a few hours to three weeks, but is usually from five to seven days.

Symptoms.—The invasion begins abruptly with a chill, fever, and pain in the back, limbs, and joints. Young people may have nausea and vomiting or even convulsions. Soon after the onset the temperature rises and may vary from 104° to 108° F. The pulse varies from 110 to 130. The tongue is coated and vomiting may persist. Sweating may be present with the prostration. The spleen enlarges early and jaundice may develop, which indicates a severe form of the disease. There is no characteristic eruption, though there may be a roseola, mottling of the skin, or petechial spots. Herpes may also develop. There is usually leucocytosis. At any time from the fifth to the seventh day the crisis may occur, with sweating, diarrhœa, and sometimes collapse. Sometimes epistaxis or hæmorrhage from the stomach or bowels may accompany the fall in temperature. For about a week the intermission persists, when a return of all the previous symptoms may occur. The second crisis may occur at the end of a week. There may be four or five relapses. Some cases terminate with the first crisis.

Prognosis.—The disease is fatal in about 4 per cent of the cases. In feeble and aged individuals death may occur in the first attack.

Complications are not frequent. Nephritis and hæmaturia may occur. Pneumonia and paralysis are not frequent complications. Pregnancy usually terminates in abortion.

The **diagnosis** of the disease is certain when we find the organisms in the blood.

Treatment.—Hygiene, fluid diet, and careful nursing are the most effective elements of treatment. No drug affects the course of the disease. If collapse occurs, treatment directed to that condition is necessary. Severe pain may require opium. There is here a splendid opportunity for serum therapy, since the blood alone contains the cause of the disease.

CHOLERA ASIATICA

Definition.—This is a specific infectious disease caused by the *comma bacillus of Koch* and characterized by violent purging and vomiting, rapidly terminating in collapse. The bacillus is a bent rod, or spirochæte, slightly shorter and thicker than the *Bacillus tuberculosis*, found in pure cultures in the rice water stools. The toxines produced by this organism are especially active, and a very active antitoxine is produced in the blood of those who recover. The artificial antitoxine has been used in large quantities in India, has proved its prophylactic and curative power in many cases, and is worthy of trial in every case. The bacillus is readily killed by drying or boiling.

As a disease, cholera is not highly contagious, depending for its spread upon infection of the susceptible gastrointestinal tract of the victim. The bacillus is contained in the vomitus and stools, and hence these are the chief sources of infection. Some individuals are more susceptible than others to the infection, and innocent diarrhœas are fertile soils for the cholera bacillus. All ages and races are prone to the infection. Fruits and vegetables partly decayed, infected water and vessels, and the ubiquitous fly are all carriers of the infection. Communities at the sea level are more frequently infected than those at greater altitudes, probably because of the commercial exposure to infected immigrants.

One attack does not immunize to a second.

Symptoms.—There is usually an incubation period of one or two days, with diarrhœa and possibly vomiting. There may be accompanying headache and mental depression. The temperature may not rise in this early stage. The diarrhœa increases and profuse watery evacuations occur in rapid succession as the stage of collapse sets in. Accompanying this active purging are colicky pains with tenesmus and cramps of the legs and feet, together with exhaustion. As collapse occurs, the features are pinched and shrunken, with an ashy gray skin covered with cold, clammy sweat. Later cyanosis is evident as the collapse becomes more extreme and the heart's action grows very rapid and feeble. The tongue is coated white and dry. The temperature of the mouth or axilla may be five or ten degrees below normal while the rectal temperature will be 103° or 104° or more. This condition may pass on to coma and death, or may be followed after a short duration by a period of reaction. During the stage of collapse the urine is diminished in amount, and this is due to the tremendous drain of fluids from the circulation and the body in general. The fæces are at first bile stained and yellow, changing to grayish white and later to the turbid "rice water" stools characteristic of the disease. "Rice water" stools consist of mucus, granular detritis, blood, and the fluid exudation, which contains albumin, the salts of the blood, and bacteria. The amount of fluid extracted from the circulation by the diarrhœa accounts for the circulatory disturbances common to the disease. The cases of sudden death before the purging begins are known as "cholera sicca," or dry cholera. Mild cases are known as "cholerine."

If the stage of collapse does not terminate life, the reaction period sets in, and we observe a steady improvement. The cyanosis disappears. The cold, clammy skin becomes warm and dry. The pulse becomes stronger and full. The temperature may rise. The urine increases in amount. The diarrhœa becomes less active, and abdominal pain disappears. Every feature improves and convalescence is soon established, the patient feeling well in three or four days. This is the picture of the average case.

Instead of the uneventful recovery, there may be a relapse and return of all the worst features, with death in coma. Deaths in such cases have been attributed to uræmia from suppression.

During epidemics there may be all grades of severity, but the general features and a bacteriological examination will determine the diagnosis. Complications are not common, and they usually occur in those organs most affected in their circulation. Nephritis may develop, but is not common. Colitis may follow the intestinal irritation. Pneumonia and pleurisy sometimes occur. Other complications may occur, but are not common.

Diagnosis.—The *diagnosis* of the disease is easy when an epidemic exists, but cholera must be distinguished from poisoning due to drugs, such as arsenic or bichloride of mercury, or the ptomaines of food or fungi.

Prognosis.—The *prognosis* is uncertain and varies in the different epidemics between 30 and 80 per cent.

Treatment.—The treatment is prophylactic and medical, as in all infectious diseases. The preventive treatment depends on the isolation of patients, prevention of the general spread of the infectious stools, etc. Hence all clothes and bedding, together with all the stools, urine, vomitus, etc., should be thoroughly disinfected before their final disposition. The water used for drinking, washing, etc., should be pure and free from possible contamination. The diet when epidemics exist should be carefully attended to and errors should be avoided.

If suspicion of an attack or a diarrhœa begins, early intelligent treatment should be instituted, thus preventing the exposure of a fertile soil. Once the disease begins, opium or morphine should be used hypodermically to control the diarrhœa, and acetate of lead and large doses of bismuth may also be used to aid in controlling the purging.

For the vomiting, *lavage* may be used early. When collapse sets in, *enteroclysis* of a warm saline solution may be given to replace somewhat the loss due to the severe purging. Heat externally should also be used to overcome the shock of collapse. Hypodermoclysis and infusion of a saline solution into the arm should be used if the circulation becomes greatly embarrassed. Together with the above mentioned measures, the hypodermic use of ether, camphor, and strychnine may be required by the condition of the heart. It is in this stage of the disease that close watching and careful treatment may turn the tide in favor of the patient; hence the value of careful, expert nurses and physicians. Following the collapse, the patient will need careful regulation of the diet to insure a continued convalescence or completion of the reaction stage.

VARIOLA

Definition.—This is an acute infectious disease characterized by an eruption which passes through the stages of papule, vesicle, pustule, and crust. It is usually regarded as the type of the exanthemata, because of the four stages of the eruption. Dr. Councilman, of Boston, professes to have discovered the specific cause to be a protozoon.

Age and sex have little or no influence upon the susceptibility, though the colored race particularly are said to fall ready victims to its virus. The fatality in blacks is about 42 per cent and in whites about 35 per cent. The more frequent exposure of colored persons, because of their usual function of servant and laundress, is probably the real explanation of their greater death rate.

The contagion is developed in the body and given off in the secretions and excretions. That it may retain its virulence for long periods in districts once infected has been demonstrated. The retention of infection in clothes has been reported after seventeen years. As in the other exanthemata, mild attacks may follow exposure to severe cases, and, conversely, severe infection may result from exposure to very mild cases.

Clinical Varieties.—In describing the disease, it is customary to distinguish three forms, two of which are again subdivided, depending upon the severity of the symptoms, as follows: *Variola vera*, (*a*) discrete; (*b*) confluent. *Variola hæmorrhagica*, (*a*) purpura variolosa, or black smallpox; (*b*) variola pustulosa, or hæmorrhagic pustular form. *Varioloid*, smallpox modified by vaccination.

Symptoms.—Unless death intervenes, there are four stages to each form, viz.: *incubation*, *invasion*, *eruption*, and *desiccation* and *decrustation*.

INCUBATION.—This period may vary from eight to twenty days, usually lasting between nine and fifteen. During this period there is seldom any complaint other than of "malaise."

INVASION.—This is sudden, with a chill in adults and convulsions in children, and a rapid rise of temperature, which may reach 103° or higher.

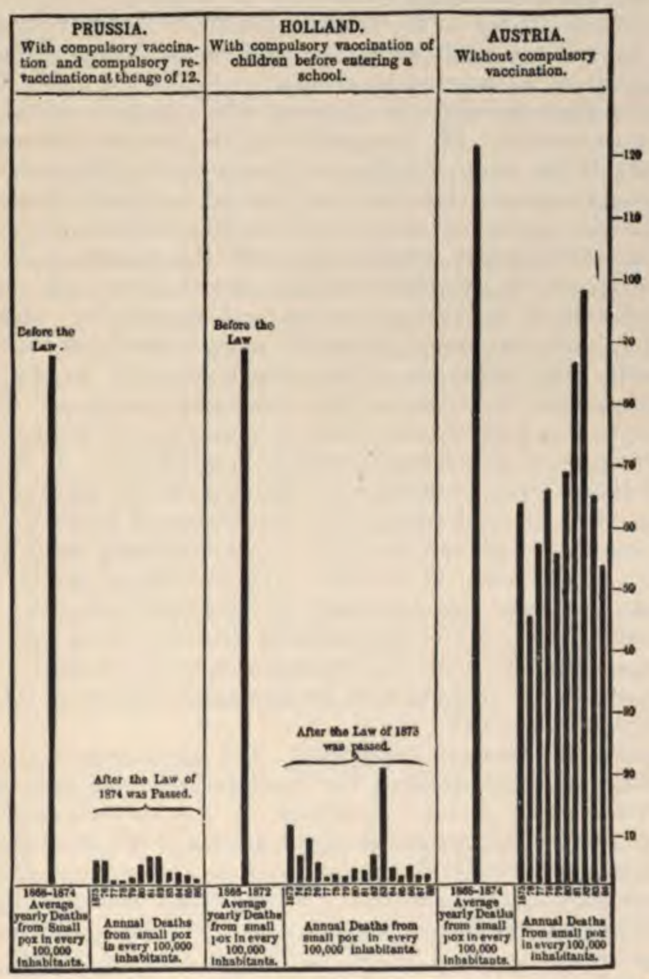

FIG. 209.—THE VALUE OF VACCINATION (from Phila. Med. Journal, 1899).

Severe frontal headache, lumbar pains, and vomiting are constant symptoms. The pulse becomes frequent and full, seldom dicrotic. The respirations are increased in frequency. The face is flushed and the mucous membranes of the tonsils and pharynx are dusky. The eyes are bright. The general appearance is anxious and restless. With the high temperature there may be delirium. On the second or third day of this period the variolous rash may appear. Two forms of the rash may be described: the diffuse, or scarlatinal, and the macular, or measly. Occasionally, with either of these, there may be petechiæ. The extent of the surface involved varies, and may vary in the same case from time to time.

Points of election are usually the groin and inner surface of the thigh, the axillæ, the pectoral regions, and the inner surface of the arm, but any other point may be affected. The surfaces involved may or may not be elevated above the surrounding surface.

The ERUPTION, in the form of round red spots, appears usually about the fourth day, on the forehead, at the anterior boundary of the scalp, on the wrists, and on the mucous membrane of the mouth. On the second day these red areas develop into papules, which in turn, about the sixth day, change to vesicles. By the eighth day the vesicles become pustules. As the change from clear, umbilicated vesicles to turbid pustules occurs, the surrounding tissues become swollen, injected, and very tender.

With the first appearance of the eruption the temperature usually falls and the general symptoms subside, but with the change to pustules the temperature again rises, the pulse becomes very frequent, and the suffering from the condition of the skin and mucous membranes is very great. There may be stupor and delirium, in which the patient continues for from three to eight days. The condition of the patient now may be said to be the result of a toxæmia from the multiple abscesses, which are infected by streptococci and staphylococci. This second rise of temperature and return of symptoms, therefore, is pyæmic in character. As the pustules become distended their contents are evacuated by the rupture of the retaining wall, either spontaneously from the increased internal pressure or by friction from without, and the thick pus is discharged on the surrounding surface and bed linen or clothes. The warmth of the body quickly brings about drying of this mucilaginous material, with the subsequent crust formation. Rupture of the pustules does not occur everywhere at once, but rather in the order of the appearance of the rash. With this maturation, crusts are formed, and the general condition and appearance of the patient are repulsive.

The eyelids are swollen, œdematous, and glued together with thick crusts, making vision impossible. The nasal chamber may be so encroached upon by crusts as to prohibit breathing by the normal passages. The larynx may be completely occluded by the œdema of the mucous membrane and the subsequent vesicle formation, so that at any time tracheotomy may be necessary to preserve life. Whether the condition becomes as severe as this or not, the loss of voice is usually complete, for the tongue is stiffened by the swelling and almost completely fills the mouth. The lips are swollen and stiffened and practically immobile. On this account breathing by the mouth is difficult and feeding is made painful and tedious.

DESICCATION.—During the third week drying of the crusts and decrustation proceed rapidly, and the temperature gradually falls to normal, though it may not reach that point until the fourth week. Complete scarring may not be accomplished for three or four weeks. In some cases complete epidermal casts of the hands or feet may be shed.

Confluent Variola.—In this form of the disease the initial symptoms are the same, though usually of greater severity. On the third or fourth day the rash appears, but the earlier the appearance of the rash the greater the probability of the vesicles later becoming confluent. As the eruption develops, the skin becomes swollen and hyperæmic and the papules appear very close together. The crowding is especially marked on the hands and legs, less on the arms and thighs, and usually they are discrete upon the trunk. The confluence of the pocks is especially marked upon the hands, legs, and face.

As the eruption appears the symptoms subside somewhat, but seldom become so slight as in the discrete form. The temperature may fall to normal, but usually it does not. On the eighth day, with the change to pustules, the temperature again rises and the swelling and hyperæmia of the skin are very severe. By the tenth day the maturation is complete and we observe large superficial abscesses. The temperature is usually high, 103° or 104° F., with a frequent, rapid pulse of 110 to 120. All the symptoms of the discrete form are present in this, though in a more severe form, and the picture is somewhat more hideous.

Hæmorrhagic Smallpox.—The differential diagnosis between the two forms of hæmorrhagic variola depends upon the time of the appearance of the hæmorrhages. In purpura variolosa the symptoms begin very suddenly and severely, usually with chills. It is more common in youth, in females, and in pregnancy. This form is rarely if ever seen in those who have been vaccinated. By the second or third day there is a diffuse hyperæmic rash, especially marked in the groin, and numerous petechiæ are to be found. As the rash extends the hæmorrhages become more marked. There may be ecchymosis in the conjunctiva, and as early as the third day severe hæmorrhages may occur from any point of the mucous membranes. This form is regularly fatal and death may occur on the third or fourth day, before the rash appears.

In the second form, or hæmorrhagia pustulosa, the hæmorrhages occur when the change to vesicles or pustules takes place, on the seventh, eighth, or ninth day. The earlier the hæmorrhages the greater the danger. This form is more common in weak men and inebriates. The prognosis is very bad.

An unclassified form has been described in which there are hæmorrhages during the vesicular stage, followed by a very rapid disappearance of the rash and speedy recovery.

Varioloid.—This is variola modified by vaccination. It is a very mild form, though the onset may be sudden and the symptoms rather severe. The temperature may reach 103°, but with the appearance of the papules, on the third or fourth day, the temperature drops and the patient feels well. The secondary rise of temperature does not occur. With the drop of temperature the papules and vesicles begin to disappear. Thus we have several names applied to the condition, depending upon the appearance of the dried vesicles, such names as horn, crystalline, and wart pox.

COMPLICATIONS.—These are comparatively few when we consider how severe is the disease.

Laryngitis may be serious in three ways. There may be a fatal œdema. With convalescence there may be *necrosis* of the *cartilages*. The diminished sensitiveness of the mucous membrane may permit the inhalation of particles which excite a fatal pneumonia.

Bronchopneumonia is the usual form in fatal cases, while lobar pneumonia is a rare condition. *Pleurisy* is a common complication in some epidemics.

Cardiac complications are in general rare. A systolic murmur at the apex is rather common during the height of the fever, but endocarditis is rare. *Pericarditis* is uncommon, while *myocarditis associated with endarteritis* of the coronary arteries is more usual. *Gastritis, enteritis,* or *colitis* is rare. *Inflammations of the kidney* are rare, while *albuminuria* during the fever is usual.

Changes in the nervous equilibrium, such as *convulsions,* or *postfebrile insanity,* are not common. *Neuritis* is not common, though it is the more usual form of nervous disorder.

The changes in the skin are the most inconvenient complications. *Acne, boils,* and *local gangrene* do not occur.

Inflammations of the joints may occur.

Catarrhal or purulent *conjunctivitis* is common in severe cases, while *iritis* is uncommon.

Otitis media does occur, though it is not frequent.

THE DISTINGUISHING CHARACTERISTICS BETWEEN MILD DISCRETE SMALLPOX AND CHICKENPOX

	Smallpox.	Chickenpox.
Age	Any age	Childhood usually.
Incubation	Two weeks	Thirteen to seventeen days.
Invasion	Marked headache, backache, fever, general malaise, lasting three to four days.	Is none, or at most only slight; worse in the covered portions, thorax.
Surfaces attacked	Worse on the exposed parts, extremities; invariably on the palms.	Rarely or never seen on the palms or soles.
Character of the eruption	Progressive; papules, vesicles, pustules, crusts; feels like shot under the skin. Multilocular.	Papules and crusts; lesions very superficial; easy to rupture. Unilocular.
Temperature	Remains high (103° to 105°) till eruption appears, then drops and does not rise again for a week, and not then in the milder discrete forms.	Rises with the severity of the attack.
Contour of the eruption	Quite uniform in size; has a reddened area at base; frequently umbilicated.	Not uniform; also inflamed area about the vesicle, but less marked.
Sensation	Painful to the touch; may itch.	Not painful to touch.
Duration, including period of invasion and desquamation	Two to four weeks.	One week to fourteen days.
Vaccination	Protects	Does not protect.
Mortality	High in severe confluent and hæmorrhagic types.	Nil.
Resolution	By crisis	By lysis.

Prognosis.—In those who have not been vaccinated the mortality ranges from 25 to 35 per cent in different epidemics, while in those who have been vaccinated the percentage of deaths is only about 1.29 per cent.

The hæmorrhagic type is usually fatal. High temperature, delirium, and subsultus are grave symptoms, while severe laryngitis or pharyngitis is fatal.

Diagnosis and Differential Points.—In the early stages the rash may be confounded with that of scarlatina, measles, or cerebrospinal meningitis. Later varicella, the pustular form of glanders, and pustular syphilis have to be thought of. During epidemics the distinction is usually easy.

Treatment.—The treatment should be directed to the alleviation of symptoms and complications as they arise, and, above all things, should be rational.

Prophylaxis should be carried out very minutely, and *vaccination of all the attendants should be insisted upon.* The patient should be vaccinated if seen early, during the invasion, as this has seemed to affect the course of the disease when performed at this early stage. The clothing, bedding, and excretions should be thoroughly disinfected and where possible should be destroyed by fire. Crowding of patients should not be allowed, and open, airy wards or tents should be used. Free circulation of fresh air should be procured. The immediate care of the patient is most important, hence competent, faithful nursing is essential.

The diet must and should be fluid; hence milk, modified in various ways, alternated with good broths, can be relied upon (see Fever Diet). Cold drinks should be given in unlimited quantities, thus aiding the elimination of the toxines by the kidneys and at the same time influencing the temperature somewhat favorably. For high temperatures the cold sponge or bath should be performed, remembering always that antipyretic drugs are depressing and therefore best not administered.

In anticipation of the crust formation, it is wise to cut short all the hair, thus rendering the parts more readily accessible to local treatment and diminishing the source of subsequent discomfort. As an aid in softening the crusts, an oily fluid, such as vaseline, or some bland oil, may be used. Over the face a mask of gauze, kept wet with some weak antiseptic, such as carbolic or mercury bichloride, will add materially to the comfort of the victim. Cleansing the eyes frequently with a boric acid solution will prevent the complicating inflammations of the conjunctiva which may otherwise occur. The mucous membrane lining the nose and the mouth should be frequently and carefully moistened and cleansed, thereby diminishing the crust formation and at the same time the obstruction of the passages. Care as to these details will add greatly to the comfort of the patient.

For the cervical adenitis and angina, cold applications on the neck will afford relief. If laryngeal or nasal and buccal obstruction develops, so that asphyxia is threatened, tracheotomy should be performed.

Drugs.—In the first stages of the complaint a thorough intestinal purge, such as calomel, should be given, thus preparing the tract for the subsequent fluid diet. If diarrhœa develops, it can be controlled by the administration of the deodorized tincture or the camphorated tincture of opium in frequent small doses. Dilute hydrochloric acid will aid digestion.

Constipation can be relieved by warm saline rectal irrigations given every second day. Enteroclysis is indicated for its stimulating effects. A water or air bed should be used if the patient's condition requires it. Complications are treated as they arise.

VACCINIA, OR COWPOX; VACCINATION

Vaccinia is an eruptive disease of cattle the virus of which, inoculated into man, produces a pock at the point of inoculation, together with constitutional changes which render the individual more or less immune to variola. The virus is contained in the vesicular lymph, which is known as vaccine. Two varieties of vaccine are used—that taken directly from the calf, which is known as animal lymph, and that taken from a person recently vaccinated, which is known as humanized lymph. *The animal lymph, obtained from some reliable source, is the best and most common virus used in these days of infection studies.*

Inoculation, or vaccination, is performed in the following manner. A point on the arm, preferably the left, is selected where the deltoid is inserted into the humerus. If, in response to society's demands, the leg is selected, a point anterior to and three or four centimetres below the head of the fibula is selected.

The area is now thoroughly washed with soap and water, followed by alcohol. While the skin is held on the stretch, cross markings with a sterile scalpel, lancet, or needles are made sufficiently deep to bring the serum to the surface, but not to draw blood. This area should be at least half a centimetre square. The virus, or serum, is now applied and well rubbed in. The glycerinated preparations are probably the best, and a sterile toothpick may be used to rub in the serum.

If the old ivory point is used, it is well to dip it in warm water for a moment before rubbing it upon the excoriated surface. The virus applied, it is well to wait until the vesicles form before protecting the point of inoculation from the friction of the clothes or other objects. The drying of the blood serum at the point of vaccination will prevent possible infection with objectionable bacteria until the vesicular stage. Protection is readily obtained with clean sterile linen or gauze, or best with one of the numerous raised shields to be had in the market. A small pill box inverted over the area and fastened on with adhesive strips does very well. In applying adhesive strips, be careful not to completely encircle the arm with them or apply them with tension, as they will cause constriction and set up irritation and discomfort about the point of vaccination. Such a raised shield may be left undisturbed for a week unless some complication indicates its earlier removal for inspection or treatment.

Symptoms.—After inoculation there is a period of incubation, with irritation at the point of application. On the third day a papule, surrounded by a zone of induration, appears and enlarges until the eighth day, when it reaches its maximum size. The vesicle has raised margins, with a depressed or umbilicated centre, and contains a clear, limpid fluid. It is a multilocular vesicle, and hence does not collapse if punctured. About the tenth day the areola enlarges and becomes more extensive, while the skin is swollen, indurated, and painful.

On the eleventh or twelfth day hyperæmia begins to diminish, the lymph becomes more gelatinous, and by the fourteenth day dries into a hard brownish scab. From the twenty-first to the twenty-fifth day, the scab may separate, leaving a circular, pitted scar, somewhat reddish and slightly tender to manipulation. The usual scar changes occur, and after an indefinite period a white cicatrix results.

With or before the appearance of the vesicle, on the third day, constitutional symptoms more or less severe cause the patient to be restless or irritable. The temperature usually rises and may remain slightly elevated until the eighth or ninth day. In children, when first inoculated, the general symptoms are as a rule less severe than in second or subsequent vaccinations.

Enlargement of the inguinal or axillary glands, more or less severe, follows the purulent change of the vesicle. Examination of the blood shows a marked increase in the number of the leucocytes.

The usual time of vaccination in children is from the third to the sixth month and whenever an epidemic exists. The duration of immunity is variable; in some cases it is absolute; in others of only a few years' duration. Revaccination should be done at the age when the child is about to enter school and whenever there is an epidemic or exposure of an individual to a case occurs.

The *general symptoms* of *revaccination* are usually more severe than those of the first. The vesicle is smaller, but the hyperæmia and induration are apt to be more intense, and the scar is less perfect. The larger and more perfect the scar, the greater the immunity seems to be, an observation well attested by excellent authority, though no one should refuse to be revaccinated because of a large scar.

Though the foregoing is the usual course of vaccination, there are numerous variations, both of the pock and of the general symptoms. Thus, there may be a very rapid development with itching, and the lymph early becomes opaque, with incrustation on the seventh or eighth day. Again, the evolution may be slow and the contents be bloody, or there may be ulceration with inflammation. The pock may recur for several weeks. Less frequently there may be a general rash on the body. In children vaccinia may in rare instances be fatal.

Complications of vaccinia are due to infection of the wound, either at the time or secondarily, by the virus of local or general diseases. Erysipelas, syphilis, and tetanus are the most common. It is doubtful if tuberculosis is ever inoculated by this means. The possibility of inoculating disease is greatly diminished by the use of animal virus from a reliable source, with emphasis upon the *reliable*.

Vaccination has been advocated for its favorable effects upon pertussis, but the effect is doubtful. Chronic constitutional diseases may be given an impetus by vaccination, and the rationale may be readily understood. The body, with just sufficient resistance to withstand a chronic disease, is unable to bear the added load of a new infection; hence both infections are more active for the time being, and may leave the organism less able to withstand the burden of the chronic disease.

BUBONIC PLAGUE; PEST; BLACK DEATH

This disease is an infection by the bacillus pestis with a pronounced localization in the lymph nodes in the inguinal axillary, cervical, and popliteal regions. After three or four days of indefinite septic symptoms the glands swell and suppurate or become gangrenous. As in most septic diseases, we recognize a *mild*, a *severe*, and a *malignant* form. In the latter the poison localizes itself in the viscera or there is a general toxæmia without localization.

The three clinical varieties, the bubonic, the pneumonic, and the septicæmic, may be defined pathologically as follows:

1. *The Bubonic, or Lymphadenal, Variety.*—This is a regional lymphadenitis or "typical bubo," characterized anatomically by a chain of hæmorrhagiconecrotic nodes embedded in serohæmorrhagic œdema.

2. *The Pneumonic Variety.*—This occurs as a lobar or lobular consolidation essentially indistinguishable, histologically, from pneumococcal and other bacterial pneumonias.

3. *The septicæmic variety,* which is a bacillæmia without the association of pneumonia, lymphadenitis, or other gross lesions resulting from bacterial activity.

Treatment.—In the present stage of our knowledge the treatment is prophylactic and symptomatic.

CHAPTER XXVI

DISEASES DUE TO FAULTY METABOLISM, TO FAULTY INTERNAL SECRETIONS AND TO DERANGEMENTS OF THE DUCTLESS GLANDS

SYNOPSIS: Gout.—Diabetes.—Obesity.—Scurvy.—Diseases of the Thyreoid Gland.—Myxœdema.—Cretinism.—Basedow's Disease.—Exophthalmic Goître.—Goître and New Growths.—Diseases of the Suprarenal Gland.—Addison's Disease.—Diseases of the Pituitary Body.—Acromegaly.—Diseases of the Spleen.—Diseases of the Thymus Gland (vide Pædiatrics and Mediastinal Disease).

GOUT

Definition.—A constitutional disorder characterized by paroxysmal attacks of inflammation of joints, associated with the formation of chalklike concretions in and about the joints and in other parts of the body.

The term *lithæmia* is sometimes applied to the disposition toward the formation of the gouty concretions and calculi.

Podagra, cheiragra, gonagra, and *cleidagra* are terms employed to indicate the point of local inflammation, as for pain in the metatarsophalangeal joint, the metacarpophalangeal joint of the thumb, the knee joint, and the sternoclavicular joint respectively.

When a gouty joint is dissected after death, the articular cartilages are found encrusted with a white mortarlike material, which upon analysis is found to be sodium biurate. It is found in specks, streaks, and patches, and may be confined to the articular cartilages or extended to all the structures about the joint, such as ligaments, fasciæ, tendons, synovial membranes, and synovial fluid. From the enlarged joints these concretions may infiltrate overlying tissues and become subcutaneous, when they constitute the chalk stones, or tophi. These hard masses may become as large as walnuts or small oranges. They may perforate the skin and discharge a purulent material containing myriads of fine crystals of sodium biurate and develop into indolent ulcers.

The *synovial fluid* becomes thick and scanty, or there may be a small effusion of fluid into the cavity of the joint. Later there may be erosions of articular surfaces, and thickening of the ends of the bones.

The joints most frequently affected are the metatarsophalangeal joints of the great toes and most often only these; then may follow the ankles, knees, hands, and wrists. The elbows, shoulders, and hips are more rarely involved. Most rarely are the sternoclavicular, intervetebral, temporomaxillary, and laryngeal articulations.

The gouty deposits are also frequent upon the cartilage rims of the ear, tendons, various aponeuroses, the skin of the palm of the hand or soles of the feet, eyelids, nose, and other parts of the face. More rarely they occur upon the vocal cords, the cranial and spinal dura mater, the pia mater, the sclerotic coat of the eye, the fibrous sheaths of nerve trunks, and the aortic valves.

A peculiar interstitial nephritis, with atrophy, is so often associated with this disease as to have received the name of "gouty kidney," or the "gouty form of Bright's disease." The peculiar feature of this nephritis is that sometimes uratic deposits are found in the kidney parenchyma. This latter condition seems more often to exist among the poor in hospital cases. In most cases renal disease is a sequence of gouty paroxysms, but in some it may precede or arise with the arthritic symptoms. In the well-to-do a marked gouty diathesis may exist with apparently no change in the kidneys.

An *endarteritis of gouty origin* is doubtless the cause of many of the obscure circulatory and nervous symptoms of irregular gout.

Ætiology.—The important underlying factor in gout is probably intestinal autointoxication brought about by faulty secretion of one or more of the glandular organs connected with the digestive tract, accompanied by the production of irritating poisonous substances which interfere with normal metabolism.

INTRINSIC CAUSES.—*Age.*—Most frequently middle aged people and people advancing in years have gout. The typical attacks come oftenest between the ages of thirty-five and fifty. If there is a strong hereditary taint, it may come earlier. Young men and boys at school exceptionally have gout. Or the first attack may come in old age.

Sex.—It is rare in women, which is probably due to dietetic differences. It is said that the catamenial discharges protect women to a certain extent. After the menopause, irregular gout is not uncommon.

Heredity.—Gout runs in families. Three fourths of the cases can be traced to a gouty ancestry. Women of gouty families may escape, but the transmission through females is more certain than through males.

Bodily Conformation and Individual Peculiarities.—A large frame and a vigorous appetite, with a tendency to corpulence, may be said to predispose to gout. Dietetic factors and a sedentary life added to these easily favor the invasion.

EXTRINSIC CAUSES.—*Errors of Eating and Drinking.*—"Gout is the Nemesis of high living." The ingestion of more food than can be oxidized, and the presence of those conditions in the body which prevent the working up and assimilation of even a moderate supply of food, are causes of gout. Highly nitrogenized articles help to the excessive formation of uric acid and favor the accumulation of urates in the blood. Food of animal origin is richer in nitrogen than that from vegetables, and the prevalence of gout among people who eat meat three times a day is in direct contrast to its prevalence among those who have it but once a day or three times a week.

Alcoholic beverages more than anything else are most provocative of gout. There is quite a difference, however, in the potency of these different alcoholic beverages.

Port, sherry, madeira, burgundy, champagne, strong ales, porter, and stout are much more powerful factors in producing gout than the distilled spirits.

Occupations, such as those of butlers, gentlemen's servants, butchers, inn keepers, brewers' drivers, and cellarmen, conduce to gout. Drunkards and topers rarely acquire gout, so that it seems as if the use of alcohol combined with highly nitrogenous foods were more conducive to gout than the one or the other alone.

Habits of Life.—Those who lead an out of door life and have sufficient exercise can carry on a scale of eating which would involve those of sedentary habits in the penalties of gout.

Saturnism in its relation to gout has been much discussed, and it seems that only those persons who have either an hereditary or an acquired predisposition to gout can have an attack brought about by lead poisoning.

IMMEDIATE CAUSES OF AN ATTACK OF GOUT.—They are often undiscoverable, and the attack may occur unexpectedly in the midst of apparent health.

Spring and *autumn* are the favorable times for paroxysms. At times some incident or circumstance, such as an unnatural excess of luxurious living, indulgence in rich wines, special worry, anxiety, a fit of anger, a studious effort, exposure to cold, or an accidental injury to a member or joint, may seem to be an exciting cause. However, none of these could bring the attack about were not the disease latent in the system.

Symptoms.—ACUTE GOUT.—The attack is apt to come on during the night or early morning, and there is sudden pain in one of the great toe joints, with chilliness, fever, restlessness, and sleeplessness. The next day the joint is swollen and the skin is red, tense, and shining. The joint is extremely tender and painful. The urine is scanty, high colored, and acid. Such an attack may last for a few days or for weeks.

The first attack is usually without prodromes, but the subsequent attacks and sometimes the first one are preceded by indigestion, constipation, palpitation of the heart, bronchitis, dragging muscular pains, irritability of temper, and depression of spirits. The urine is scanty and high colored or abundant and pale. There is a brick dust sediment of urates. There may be a trace of albumin, and the uric acid is below normal in amount before and during a paroxysm, but after the attack it is increased in amount.

After the inflammation has subsided, the joint returns to its natural condition or may be left a little stiff. The skin undergoes desquamation. The intensity of the inflammation of the joint varies very much in the different cases. The height of the temperature varies usually in proportion to the severity of the joint lesion, and the recovery from the first attack is usually speedy and complete, so that the patient often feels better than before the attack.

There is often an interval of one, two, or even three years before another attack, and the frequency of recurrence is greater as time goes on, until they recur once or twice a year. Then a large number of joints become involved. The attacks become subacute, and soon the condition of *chronic gout* is entered upon.

Chronic Gout.—The recovery from the paroxysms is less complete, the attacks are of longer duration, and recurrence is more frequent. Some joints may become permanently stiffened and deformed, and tophi make their appearance about the knuckles, toes, knees, and elbows. It proceeds thus only occasionally, for by a change in habits and diet the course is arrested and mitigated. Frequently as years advance one who has in middle age suffered greatly from gout may subjugate or entirely cure it. The *urine* in chronic gout is copious, of low density, and paler than normal. In about one half of all cases there is a small amount of *albumin*. It is usual to observe a diminution of *uric acid*. There is no diminution in the amount of *urea* excreted. Sometimes there is a tendency to the formation of uric acid *gravel*, and arthritic attacks seem to alternate with attacks of *renal colic* followed by the passing of uric acid *calculi*.

The blood serum is impregnated with urates, but a similar condition exists in leucæmia, pneumonia, anæmia, and Bright's disease.

Irregular, or Visceral, Gout.—One is said to have irregular gout when he has the gouty diathesis and is suffering from one or more of the associated phenomena. These phenomena are most varied in character and may implicate any function or system of the body. They may be premonitory of an attack or may come and go without any arthritic seizure; or they may occur in persons who have never had any arthritic seizures. The diagnosis is made usually by the family history and by exclusion of other causes.

Gout Affecting the Circulatory System.—Palpitation of the heart, with a faltering, interrupted pulse and syncopal threatenings, are not infrequent. A very peculiar paroxysmal disturbance of circulation is now and then witnessed in which the cardiac pulsations become extremely rapid and a condition is produced which is termed "runaway heart." Such paroxysms are very alarming. There may be a simulation of angina pectoris, and it may constitute a "*false angina*," symptomatically indistinguishable from the true angina. Great care must be made in the differential diagnosis. There is no connection between gout and endocarditis and pericarditis except by reason of changes in the blood vessels. When the kidneys become involved, increased arterial tension will damage the circulation.

Thrombosis of Veins.—The gouty diathesis seems provocative of the formation of clots in the veins, usually in the upper or lower extremities.

The respiratory organs not infrequently feel the influence of the gouty diathesis. *Asthma*, *pleurisy*, *emphysema*, *bronchitis*, and *pneumonia* are among the disorders observed.

Cirrhosis of the liver has been repeatedly found.

The gouty kidney is a *chronic interstitial* nephritis with *atrophy*, which shows its regular symptoms.

Gouty Affections of the Nervous System.—Recurrent headaches, persistent depression of spirits, and various forms of neuralgia and neuritis are frequent in irregular gout. Sciatica is one of the commonest of the forms of neuritis. Facial neuralgia is exceedingly troublesome, interfering with the ingestion and mastication of food. Neuralgic pains may affect the viscera and shift irregularly from place to place. Nervous disturbances may assume a more serious form and go on to delirium.

VERTIGO, CEPHALALGIA, INSOMNIA, NERVOUSNESS, TINNITUS AURIUM, PARÆSTHESIAS, MUSCULAR CRAMPS and TWITCHINGS, and VASOMOTOR disturbances are among the more indefinite nervous phenomena attributed to the gouty diathesis, also epileptoid seizures and insanity.

GOUTY AFFECTIONS OF THE SKIN.—*Eczema* is the most distinctive, and the most frequent situations are the external *ear* and neighboring parts, the *face, forehead,* and *back* of the *neck*. As a rule, it is not severe, but persistent, and confined to the parts mentioned, but occasionally it becomes grave in persons advanced in years, and spreads over a large part of the body.

PSORIASIS in patches, like a dry, scaly eczema, fixed, circumscribed, and often unsymmetrical in position, sometimes appears on the legs and elsewhere.

PRURITUS, local or diffused, is not uncommon, and occasionally is troublesome, particularly at night.

The *nails* may become *brittle* and ribbed, making it difficult to trim them.

GOUTY AFFECTIONS OF THE EYE.—*Conjunctivitis* and *sclerotitis* are the most common of these unusual features of irregular gout. *Gouty iritis* and glaucoma have been described. *Hæmorrhagic retinitis* in connection with gout has been observed. It comes on suddenly and is always unilateral, probably being caused by thrombosis of a retinal vein.

RETROCEDENT GOUT.—The inflammation in a joint may subside suddenly from an unknown cause or apparently the application of cold to the joint.

Differential Diagnosis.—Gout is liable to be confounded with *rheumatism, acute* and *chronic*, and *arthritis deformans*, more rarely with a gonorrhœal or *pyæmic joint* or *traumatic arthritis*. As a rule the diagnosis is easy, but exceptionally we find it difficult. Gouty inflammations are usually affirmed by finding uratic concretions in the rim of the ear or elsewhere. The gouty paroxysm is characteristic, and we get its history in later manifestations. The family history of gout yields important information, and of almost equal importance are the past mode of life and dietetic habits, particularly with regard to alcoholic beverages.

Age and Sex.—Gout seldom attacks a person before his thirtieth or thirty-fifth year unless hereditary influence is very strong. *Acute rheumatism*, on the other hand, is more frequent between the ages of fourteen and thirty. The *female* sex is very markedly more exempt from gout than from rheumatism.

Clinical Differences between Gout and Rheumatism.—1. The *fever* of gout is not so high; the local pain is more severe; the larger joints (except the knees) are less generally implicated; there is an absence of cardiac complications; sweating is not nearly so conspicuous in gout as in rheumatism; when gout is subsiding, *œdematous pitting* is usually observed about the joints, followed by a desquamation of cuticle. This is not seen in *rheumatism*.

2. In *chronic* and *irregular gout* the diagnostic difficulties are at times most embarrassing. The term *rheumatic gout* is no longer in favor, still in exceptional cases the two diseases may be combined, as a gouty person may have rheumatic fever as a separate infection.

3. From *arthritis deformans* we distinguish gout as follows:

Gout	*Arthritis Deformans*
1. More common in men.	Commonest in women.
2. Middle age disease.	Disease of older people.
3. Well nourished individuals.	Often poorly nourished people.
4. Pain is spontaneous.	Pain upon motion.
5. Rapid onset.	Gradual onset.
6. Not symmetrical.	Often symmetrical.
7. Temporomaxillary joint seldom attacked.	This joint often affected.
8. Decreased diet improves trouble.	Increased diet improves.
9. Tophi characteristic.	None.

Rheumatism may predispose to *arthritis deformans*, and the latter may be associated with gout.

A *gonorrhœal joint* is associated with a history of gonorrhœa.

A *pyæmic joint* is accompanied by infection in some other part of the body and by a septic temperature curve.

A *traumatic arthritis* involves a history of injury.

The **prognosis** depends upon the complications. However favorable it may be for the first attacks, permanent release from the disease is rarely to be hoped for unless the strictest hygiene and dietetic rules are followed for the rest of life. With the most careful observance of all these prophylactic and dietetic measures of treatment, future attacks will be rare or comparatively mild and may cease, and severe lesions of internal organs will not occur.

If the *kidneys* remain sound, and the periodical attacks are not too frequent and too protracted, the general level of health is not appreciably lowered.

Albumin in the urine is an untoward sign, but gouty persons may have traces of albumin in the urine for many years, even to old age.

With disease of the kidneys, the *heart* becomes affected, and sooner or later compensation fails, with consequent *œdema, dyspnœa, debility,* and *emaciation.* A speedy end may be brought about by *uræmia, cerebral hæmorrhage,* or *embolism.*

Treatment.—PROPHYLAXIS.—Temperance and hygienic living in all people, particularly in those who are the offspring of gouty parents, is the best protection. An active out of door life, with systematic exercise in the open air, as by walking, riding, or driving, golf, or tennis, is essential. Heavy dinners and late hours should, as far as possible, be avoided, as well as anxious and worrying engagements and undue mental and bodily fatigue. The action of the skin must be kept in order by means of baths and friction. As gouty people are generally neurotic, idleness should not be encouraged. A glass or two of hot water before going to bed and upon rising tend to carry off waste products.

DIET.—As has been seen, the habit of overeating and drinking, the indulgence in meats, heavy, sweet wines, and malted liquors, directly predisposes to the gouty diathesis. A moderate amount of meat once a day and great temperance in alcoholic beverages must be insisted upon. An abundance of rich food must be avoided, and the watchword is plain living. A change to a vegetarian diet may be called for.

In an ATTACK of GOUT the bowels should be relieved at the outset by a suitable purge.

℞ Podophyllin, ... gr. ⅓;
Calomel, ... gr. x;
Pulv. aromatic, ... gr. v.
M.

The skin also should be made to act. If there is high fever the patient should be put to bed upon a diet of milk, farinaceous foods, and freely administered diluents. Water and peppermint water are excellent drinks. *Alcohol* should be withheld except in old, feeble people who may have a little spirits, and whose diet must not be too meagre. There should be no bleeding, no leeching; they are not necessary, and the application of cold to the joint seems not to relieve pain. The joint should be at rest, swathed with cotton and covered with an impervious protective, which acts as a poultice, promotes transpiration, and relieves pain.

For the *relief of pain* we employ the usual narcotics and sedatives, such as morphine subcutaneously, chloral and bromide, phenacetin, and acetanilide. Iodide of potassium and salicylate of sodium may be given in fairly large doses. Such drugs are to be taken two or three times a day in combination with 10 to 25 drops of the wine of colchicum. As soon as active inflammation subsides, the use of these drugs is to be discontinued and a regimen adopted which will diminish or overcome *intestinal toxæmia*, viz.: Plain mixed diet, one third less meat. Abundance of water (mineral water not essential). Ten drops of dilute hydrochloric acid, in water, after eating. A teaspoonful Carlsbad salt in the morning, in warm water. One aloin pill at bedtime. Exercise, warm baths, and general massage.

The TREATMENT of CHRONIC and IRREGULAR GOUT is carried out on the same lines. It consists principally in *diet* and *regimen*. The proteids in food furnish uric acid, and although they exist in vegetables, the foods of animal origin contain a much higher percentage. *Fat, starch,* and *sugar* have no direct influence in the production of uric acid, and their free consumption lessens the amount of nitrogenous food taken and indirectly diminishes the production of uric acid.

TABLE SHOWING AVERAGE PERCENTAGE OF ALBUMINOID MATTERS CONTAINED IN DIVERSE ARTICLES OF FOOD

Animal food.	Albuminoid matter.	Vegetable food.	Albuminoid matter.
Butcher's meat	19 per cent.	Bread	8 per cent.
Fowl	20 " "	Oatmeal	12 " "
Game	22 " "	Rice	6 " "
Fish	17 " "	Green peas	6 " "
Egg	13 " "	Potatoes	2 " "
Milk	4 " "	Carrots and turnips	1–2 " "
Cheese	30 " "	Green vegetables and salads	1–2 " "
		Fresh fruits (excluding nuts)	½–1 " "

Gouty people should partake cautiously of meat, fowl, game, and cheese, and as freely as their digestion will permit of bread, rice, garden vegetables, salads, and fruit. Diet is of such importance that a change in diet may make all the difference between the occurrence and non-occurrence of an arthritic attack.

Hydrochloric acid, Mx, t. i. d., in water after meals is highly important in overcoming intestinal putrefaction.

Certain alcoholic beverages play a very important part in the genesis of a gouty constitution. How it takes place is not known, but it is known that they produce no appreciable amount of uric acid. Distilled spirits have but little influence in producing gout, and whiskey and gin less than brandy. On the other hand, the richer wines, port, sherry, madeira, champagne, burgundy, and strong ales and stout are highly provocative of gouty manifestations. Most wholesome for the gouty are clarets and the light German wines. Fully fermented and mature dry wines are less injurious than sweet and new wines. For a robust gouty individual total abstinence is best, but some persons fare better with a moderate allowance of alcoholic liquors than without any, as abstinence may favor the development of a low, asthenic type of gout, manifestly more injurious to the general health than frank inflammatory attacks.

Mineral Springs.—Those containing sodium salts are probably provocative of harm rather than good. Among those which contain no sodium or only a trace, there are in England Buxton and Bath; in Germany Wildbad, Neuenahr, Teplitz, Ems, and the Säuerling Spring at Carlsbad, in Austria; in France Aix-les-Bains, Contrexeville, Vichy, and Barège; in the United States the waters of Saratoga, Bedford, and the White Sulphur Springs. No doubt the effect of these springs is due to their watery constituents rather than the minerals which they contain. In the quantities in which they are taken, and upon an empty stomach, they dilute the blood and help the kidneys in elimination.

LOCAL TREATMENT OF GOUTY AFFECTIONS.—Thickening, stiffness, and aching often persist long after an attack has passed away. Painting the joints with iodine, wet compresses, friction with stimulant liniments, shampooing with passive motion, and the application of flying blisters, all seem to help. Hot mineral baths, douches, and galvanic baths have been used with success, also vibratory massage.

It is undesirable to remove the subcutaneous tophi, as the indolent ulcers remaining are very difficult to heal. If ulcers form, they are treated like ulcers of other origin, although their immersion in water for long periods, with the view of dissolving out the urates, has been most efficient.

As the affections of the skin seem oftentimes to act as a safety valve to the general system, it is desirable not to interfere too actively with them. The itching and the irritation may be so bad as to interfere with sleep, and in such cases solution of borax with glycerine, boric acid with vaseline, lead lotion, zinc ointment, and bismuth and starch powder, applied to patches of gouty psoriasis, eczema, or prurigo, often afford great relief. The intense itching of the dry eruptions may be diminished by rubbing hard paraffin over the surface, which leaves a thin layer of paraffin.

GLYCOSURIA AND DIABETES MELLITUS

In the present state of our knowledge it is impossible to give a clear definition of the enigma diabetes, and it is not always possible to make a good clinical distinction between an occasional glycosuria and the serious illness diabetes.

The blood contains sugar (0.1 to 0.2 per cent) derived from the liver in the form of grape sugar, lævulose, and pentose. Various organs, particularly the muscles, use up sugar. A superabundance of sugar, which cannot be utilized by the muscles and organs, is carried off by the kidneys. A superabundance of sugar may probably enter the circulation through the gastroenteric tract directly without passing through the liver, and thus give rise to what is known as *alimentary glycosuria.*

Transient glycosuria is observed following the administration of certain drugs, such as phloridzin, morphine, curare, chloroform, mercury, hydrocyanic acid, and nitrite of amyl, and often poisoning by carbon dioxide. It also occurs with certain infections, such as malignant pustule, cholera, typhus or typhoid fever, scarlet fever, diphtheria, and malaria. It occurs after shock, injuries, concussion of the brain, fracture of the skull, cerebral hæmorrhage, cerebrospinal meningitis, epileptic fits, anæsthesia, and experimental injury to the floor of the fourth ventricle. Glycosuria may therefore be of alimentary, hepatic, pancreatic, or central origin, etc. In the diabetic patient sugar is found in the urine on a proteid diet. In some diabetic individuals the urine becomes free from sugar whenever the carbohydrates in the food are below the limit of assimilation; in others the sugar disappears only when all saccharine and amylaceous food is stopped. These are the milder forms of diabetes. In the severe forms a strict meat and fat diet will not eliminate the sugar, which is probably formed from albumin. In some cases of severity, adiposity and goutiness are associated. It has been shown experimentally that extirpation of the pancreas in animals results in severe glycosuria, and some of our older pathologists report pancreatic disease in diabetes. On the other hand, numerous autopsies have shown a normal pancreas in diabetic subjects. The liver appears to play an important rôle in the pathology of diabetes. The excessive formation of organic acids and their acid products, acetone and β-oxybutyric acid, as found in the urine, appear to have some influence in the production of diabetic coma.

In all probability chronic glycosuria or diabetes is a complex disease of faulty internal secretion (including the glandular apparatus of the intestine), and the exciting causes may be traumatism, infection, or intoxication with subsequent organic changes in one or more of the affected organs.

Ætiology.—PREDISPOSING CAUSES.—*Heredity.*—Cases are on record in which many members of the same family have been afflicted with the disease. Some diabetics have had family histories of *gout, insanity,* and *phthisis.* Hebrews are more commonly affected with diabetes than others of the community in which they dwell.

Sex.—Men are oftener affected than women, the proportion being about three to two.

Age.—The fifth decade seems to be that in which we see the largest number of cases, although children and extremely old people may rarely be affected.

Temperament.—People of a neurotic tendency seem more likely to have the disease, the people of the older families and the more highly civilized. Thus, the older people of the older countries, as of India, Ceylon, and Italy, seem more prone to the disease than those of the more newly civilized countries. Thus the *Hebrews*, representing a highly intellectual class, a race given to a sedentary existence and often to high living, are more likely to have this disease than any other race.

Obesity has been mentioned as a cause, but its relation to diabetes is obscure.

Gout, syphilis, and *malaria* have been considered predisposing factors. The fact that a number of instances are on record where man and wife have had the disease one after the other makes us think of a contagious element (diabète à deux).

EXCITING CAUSES.—*Mental Shock.*—Severe nervous strain and worry, emotional disturbances, excessive sexual indulgence, and the climacteric precede many cases.

Injury to or *disease of* the cord or brain, particularly of the medulla, such as *hæmorrhage, new growths, sclerosis, tabes dorsalis, epilepsy, insanity,* and *Graves's disease*, have also seemed to be exciting factors.

Bodily injuries, such as *railroad accidents*, probably through a derangement of the innervation of the liver, are also reputed causes.

It follows *infectious fevers*, such as *typhus, typhoid, diphtheria, influenza, acute rheumatism, malaria, scarlatina,* and *cholera.*

Pregnancy has apparently given origin to some cases.

Occasional cases have followed *abscess of the liver*, malignant disease in the *abdomen* not involving the pancreas, *exposure* to cold, *iced food* and *drinks*, and *disease of the pancreas.*

Pathology.—The tissues after death from diabetes present as many pathological changes as are consistent, where nutrition is so seriously impaired, and may be regarded as due to failure in reparative processes.

BLOOD.—The blood may contain as much as *0.4 per cent of sugar.* There is also an excess of *urea* and *fats.*

CIRCULATORY SYSTEM.—The heart is sometimes *hypertrophied,* may be *fatty,* and may be *dilated.* Dilatation of the heart is sometimes the cause of death. *Endocarditis* and *arteriosclerosis* are frequent and may result from irritation of the lining membrane by the sugar in the blood. *Pericarditis* occurs occasionally.

THE NERVOUS SYSTEM.—*Brain.*—The brain has been found in various inconstant pathological conditions, such as anæmia, œdema or atrophy of the cortex, and congestion and thickening of the meninges. More constant and important are the changes in the fourth ventricle, where tumors, cysts, softening, sclerosis, hæmorrhage, and other changes have been found.

The *spinal cord* may show extension of the morbid processes in the brain.

Cerebrospinal Nerves.—*Tumors* pressing upon the organs and other irritations have been described. *Peripheral neuritis* is not uncommon. The *sympathetic ganglia* and *nerves* may be enlarged, hardened, or atrophied.

LUNGS.—The lungs may show secondary changes: *Bronchopneumonia, lobar pneumonia, abscesses, gangrene, tuberculous inflammations, pleurisy,* and *empyema. Congestion* and *œdema* occur oftenest.

LIVER.—This organ may be *fatty,* in an *inflammatory condition,* or *cirrhotic.* In a form of diabetes, *diabète bronzé,* there is a peculiar pigmentary degeneration of the liver associated with pigmentation of the skin.

The KIDNEYS are usually *fatty,* and *chronic nephritis* is common.

The SPLEEN may be *small, pale,* and *soft,* or enlarged and congested. Tubercles have been found in its parenchyma.

The PANCREAS has been studied in particular as to its relation to diabetes, but to no definite conclusion, as stated in the introduction. It may be firm and *atrophied,* the seat of pigmentary *cirrhosis* or of *cancer, cysts,* or fat *necrosis.* Glycogen can usually be found in any of the tissues or organs.

Symptoms and Diagnosis.—The symptoms begin insidiously, and the first things usually to attract attention are the unnatural thirst, the frequent urination of large amounts, and a voracious appetite.

EXTERNAL APPEARANCE.—We see usually wasting and emaciation, but well developed and even adipose diabetics are seen. The skin is harsh, and may show carbuncles or boils, or scars from them. It may be pigmented, *diabète bronzé.* The hair is scanty and dry.

The URINE is usually pale, of a sweetish odor and taste, with a specific gravity usually from 1.025 to 1.045, exceptionally being lower or higher, and measuring in quantity from 6 to 8 pints in mild cases, to 30 to 40 pints in severe cases, in twenty-four hours. The specific gravity has been as low as 1.002. The reaction is acid. Sugar is present in various amounts, from ½ per cent up to 10 per cent in severe cases. One to two pounds may be excreted in twenty-four hours. In exceptional cases there is no polyuria. To establish the diagnosis of diabetes, the elimination of grape sugar must be constant and extend over a long period.

The tests for sugar are given in the chapter on Laboratory Diagnosis. *Glycogen* is said to be found in diabetic urine. *Albumin* is present frequently. *Gas* may form in the bladder as the result of fermentation. *Fat* in the urine (lipuria) may exist. *Urea* and *phosphates* may be increased in amount, and *acetone* may be present. *Polyuria* is usually very marked.

SYMPTOMS REFERABLE TO THE DIGESTIVE ORGANS.—*Hunger* and *thirst* may be excessive. *Digestion* is usually good, although constipation is common and temporary diarrhœa occasional.

The *tongue* is usually dry, broad, and thick, with an irregular and fissured surface. It is sometimes coated and sometimes red. The gums may become spongy and bleed easily. The teeth tend to decay rapidly. *Thrush* may appear on the soft palate. *Jaundice* is frequently present.

CONSTITUTIONAL SYMPTOMS.—In the milder cases the general health remains unaffected for a long time. The body remains well nourished, and there is little discomfort except from the polyuria and polydipsia. In the severer cases the general health soon begins to show the drain. *Emaciation, weakness,* and exhaustion upon slight exertion are observed, and ultimately the marasmus may be extreme. The intellectual capacity is not impaired, although there is an indisposition to mental effort. *Depression* and *ir-*

ritability are usual. The temperature is normal or subnormal. If there is fever, it is due to some complication.

Complications.—The complications of diabetes are exceedingly numerous.

CUTANEOUS COMPLICATIONS.—*Furuncles, carbuncles,* and suppurative processes following abrasions, injuries, or operations are frequent. *Purpura* is often present, and *gangrene,* especially of the feet, is apt to occur. The nails are dry and may atrophy or fall out. *Herpes zoster* and *perforating ulcer* are occasionally seen accompanying the disease. *Profuse sweats* may occur.

GENITOURINARY SYMPTOMS.—It is seldom that nephritis develops except late in the disease, and then come its symptoms. *Albuminuria* and *œdema* are not infrequent. Sometimes the first symptoms are irritation and *pruritus* of the parts where moisture from the urine is likely to exist. In men there may be *balanitis,* inflammatory *phimosis,* or *paraphimosis. Impotence* may be an early symptom. Cystitis is seen from time to time.

PULMONARY COMPLICATIONS.—A fruity odor to the breath is the rule. Later in the disease pulmonary complications are very common, and nearly one half of the patients die of *pneumonia, tuberculosis* of the *lungs,* or *gangrene* of the lung.

CIRCULATORY SYMPTOMS.—The pulse and the heart are seldom affected until the disease is well advanced, when *endarteritis* and *hypertrophy* of the heart may develop. *Dilatation* of the heart may cause a fatal termination, as may also a fatty heart.

Nervous Symptoms.—The nervous symptoms are very important.

DIABETIC COMA is one of the most interesting and dreaded symptoms of this disease. It is more likely to occur in the young patients and in those in whom the disease advances rapidly and is associated with rapid emaciation. Before the onset of the coma the urine contains as much sugar as previously, although the amount of urine may be diminished in quantity. Three forms are described:

1. After an unusual bodily or mental exertion, the patient suddenly becomes prostrated, the heart's action grows rapid and feeble, the skin is cold, stupidity and a comatose condition supervene, and death occurs in a few hours.

2. For a few days (from six to nine) the patient complains of weakness and gastric disturbances, nausea, loss of appetite, constipation, pain in the abdomen, drowsiness, and breathlessness. Some local affection, such as pharyngitis, a phlegmon, or a pulmonary complication, is present. Headache, restlessness, delirium, rapid and labored breathing, cyanosis, a feeble and rapid action of the heart develop, then stupor and coma come on, death occurring in from one to five days.

3. Without previous dyspnœa or prostration, headache may develop suddenly, then vertigo, stupor, and coma, and death occurs in a few hours.

Much discussion, theorizing, and painstaking investigation have been in progress for years as to the cause of this coma, but it now seems to be the almost universal opinion that it is due to acid intoxication and that the acid is β-oxybutyric acid, which accumulates in the tissues, circulates in the blood in enormous quantities, and is eliminated in combination with other elements. Temporary improvement and even cessation of the symptoms of impending coma are not impossible, but they are very exceptional.

PERIPHERAL NEURITIS.—There may be mild neuritis in different parts of the body, giving rise to neuralgic pains, numbness, and tingling. *Sciatic* pains may be severe.

DIABETIC TABES is a name given to the association of severe neuritis with lightning pains in the legs, loss of tendon reflexes, paresis of the extensors of the feet, and the characteristic gait, which is called "steppage."

DIABETIC PARAPLEGIA is probably also due to neuritis. Cases are seen where both arms and legs have been paralyzed.

MENTAL SYMPTOMS.—*Restlessness, headache, dizziness,* anxiety, nervousness, and a tendency to melancholia are seen. Occasionally general paralysis develops.

Special Senses.—Cataract, particularly in the younger patients, is common.

RETINITIS, HÆMORRHAGE into the RETINA, OPTIC ATROPHY, SUDDEN BLINDNESS, and paralysis of the ocular muscles have been observed. OTITIS MEDIA at times seems to be diabetic in origin.

Sexual Functions.—Impotence may be a common and early symptom.

Abortion is likely to occur, if conception (which is rare) takes place. A diabetic mother may have a healthy child. Pregnancy and delivery aggravate the disease.

LARYNGITIS and FURUNCULOSIS of the LARYNX have been noted.

Course and Prognosis.—In children the disease progresses very rapidly. Most children die within one year. As a rule, the older the patient when the disease begins, the more chronic is the course. The disease is more favorable when the patient has no hereditary dyscrasia, when the disease is concurrent with obesity and gout, when it begins late in life, when the social conditions are favorable and there is freedom from business and financial worry, and when treatment is begun early. The prognosis also depends upon the degree to which treatment is successful in reducing the amount of sugar. In cases supervening after an accident or acute disease the patients sometimes get well rapidly and sometimes slowly. In cases occurring at the climacteric in women the patients are more likely to recover than in any of the other cases. The state of the circulation, indicated by arterial pressure and cardiac impulse, is of great importance in the diagnosis. Complete recovery cannot be expected, but a large number of patients may enjoy fairly good health for a number of years. If it occurs in a person under forty years old, the outlook is bad. Death occurs from heart failure, diabetic coma, pulmonary affections, or nephritis. A few die exhausted and emaciated from the disease alone. The terminal stage of diabetes is that of ethyldiacetic acid poisoning.

Treatment of Diabetes.—HYGIENE.—Worry should be avoided. The life should be even and tranquil. A climate where there are the least changes of temperature is preferable. The skin should be kept in the best possible condition, so that excretion by this channel shall be unobstructed. A lukewarm bath, or a fairly cold bath if the patient can endure it, should be taken each day. An occasional Turkish bath is admissible. Exercise, not too violent, regularly for those who can endure it is important, and massage for those for whom exercise is impossible. Bowling is a good exercise.

DIET.—After testing the amount of sugar in the urine for several days when the patient is on an ordinary diet, it is well to put him on a strict non-carbohydrate diet to see if the urine can thus be made free from sugar. Such a diet has been planned by von Noorden:

Breakfast at 7.30 a.m.—200 c.c. (℥vj) of tea or coffee, without milk or sugar; 150 gms. (℥v) of beefsteak, mutton chops without bone, or boiled ham; one or two eggs.

Luncheon at 12.30 p.m.—200 gms. (℥vj) of cold roast beef; 60 gms. (℥ij) of celery, fresh cucumbers or tomatoes with vinegar, olive oil, pepper and salt to the taste; 20 c.c. (ʒv) of whiskey with 400 c.c. (℥xiii) of water; 60 c.c. (℥ij) of coffee without milk or sugar.

Dinner at 6 p.m.—200 c.c. of clear bouillon; 250 gms. (℥vijss.) of roast beef; 10 gms. (ʒijss.) of butter; 80 gms. (℥ij) of green salad with 10 gms. of vinegar and 20 gms. of olive oil or three tablespoonfuls of some well cooked green vegetables; three sardines à l'huile; 20 c.c. of whiskey with 400 c.c. of water.

Supper at 9 p.m.—Two eggs, raw or cooked; 400 c.c. of water.

In many cases the amount of sugar in the urine diminishes so rapidly that in three days none is found. If this is the case, we can gradually add sugar and starch until we see the sugar returning in the urine, and then keep just below the limit. Patients may return to this diet for a short period at intervals of three or four months.

Diabetic patients may have the following articles of food: *Liquids.*—Soups: Ox tail, turtle, bouillon, and other clear soups. Lemonade, coffee, tea, chocolate, and cocoa; these to be taken without sugar, but saccharin may be used to sweeten them. Soda water, Apollinaris, Saratoga, Vichy, and milk in moderation may be used.

Animal Food.—Fish of all sorts, including crabs, lobsters, and oysters; salt and fresh butchers' meat (excepting liver), poultry, and game. Eggs, yolk of eggs, cream, butter, buttermilk, curds, and cream cheese.

Bread.—Gluten and brown bread, almond and cocoanut biscuits.

Vegetables.—Lettuce, tomatoes, spinach, chicory, sorrel, radishes, asparagus, water cress, mustard and cress, cucumbers, celery, and endives. Pickles of various sorts.

Fruits.—Lemons and oranges, currants, plums, cherries, pears, apples (tart), melons, raspberries, and strawberries may be taken in moderation. Nuts as a rule are allowable. To aid digestion, 5 drops of dilute hydrochloric acid should be taken after each meal, in water.

Among prohibited articles are the following: Thick soups, liver, ordinary bread of all sorts (in quantity), rye, wheaten, brown or white.

All farinaceous preparations, such as hominy, rice, tapioca, arrowroot, sago, and vermicelli.

Potatoes, turnips, parsnips, squashes, vegetable marrows of all kinds, beets, corn, and artichokes.

Liquids.—Beer, sparkling wine of all sorts, and the sweet aerated drinks.

SPECIMEN DIET FOR ONE WEEK

Supper.—One half doz. raw oysters, two lamb chops, lettuce, gluten bread and butter, cheese, and a cup of tea.

Breakfast.—Two soft boiled eggs, gluten bread and butter, and a cup of coffee with cream.

Dinner.—Bouillon and egg, a piece of steak, oyster plant, salad, gluten bread and butter, and claret wine. One half hour later, a cup of coffee.

Supper.—Cold turkey, sardines, celery, a piece of cheese cake made with gluten flour and lævulose, and a cup of tea.

Breakfast.—Two soft boiled eggs, gluten bread and butter, and a cup of coffee with cream.

Dinner.—Bouillon and egg, roast turkey, gluten bread dressing, celery, cranberries sweetened with lævulose, Mosel wine, and a cup of coffee.

Supper.—Turkey salad, celery, cheese, and a cup of tea.

Breakfast.—Two soft boiled eggs, sardines with lemon juice, and a cup of coffee with cream.

Dinner.—Bouillon and egg, a piece of steak, gluten bread and butter, cheese, claret, and a cup of coffee.

Supper.—One half dozen raw oysters, milk oyster stew, and tea.

Lunch at 10.30 a.m.—Sauerkraut and pigs' knuckles, wine and seltzer.

Breakfast.—One glass of milk and seltzer, two soft boiled eggs, and a cup of coffee with cream.

Dinner.—Bouillon and egg, corned beef and cabbage, claret wine, a cup of coffee, and gluten bread and butter.

Supper.—One boiled fish with butter sauce and celery, gluten bread and butter, and a cup of tea.

Breakfast.—Ham and scrambled eggs and a cup of coffee with cream.

Dinner.—Chicken fricassee, celery, spinach, bouillon and egg, a cup of coffee, and bread and cheese.

Supper.—Smoked salmon, cervelat sausage, gluten bread and cheese, and a cup of tea.

Breakfast.—Two soft boiled eggs and ham and coffee with cream.

Dinner.—Bouillon and egg, beefsteak and salad, gluten bread and wine.

Four p.m.—One dozen raw oysters.

Supper.—Steak, celery, bread and butter, cheese, and a cup of tea.

In order to avoid monotony, variety in soups, vegetables, flavoring and seasoning substances should be planned.

MECHANOTHERAPY IN DIABETES.—All forms of exercise are beneficial in moderation. Vibratory massage over the stomach, liver, pancreas, or the entire abdomen and lumbar region should be employed.

ELECTROTHERAPY.—The high frequency current or the static current should be tried.

INHALATION.—Ozone inhalations through a static machine attachment or a house ozone generator are useful to combat secondary anæmia. Medicinal and empirical treatment is unsatisfactory.

Brewers' yeast is given in tablespoonful doses three times a day. Blueberry leaves in decoction and powder form is a time honored household remedy. Tryptogen, which contains various digestive ferments in combination with gold and arsenic bromide, is given in five grain tablets three times daily. Desiccated glands which furnish internal secretion may be tried in *rotation* or *combination.* Improvement sometimes follows the administration of codeine, gr. ½ three times a day, up to gr. vj a day. Morphine, gr. ⅛ three times a day and upward, or phosphorus may be used. Vichy water with sodium bicarbonate added is the best drink, as alkalies counteract the tendency to coma.

The coma which is so much dreaded should always be thought of as a possibility, and long railway journeys, sudden changes of diet, constipation, mental excitement, and worry should be avoided. In coma enteroclysis, with water at 110° F. containing ʒj of bicarbonate of sodium to the pint, is indicated.

Furuncles, carbuncles, and gangrene require surgical treatment.

The increasing number of cases of diabète à deux reported in medical literature would indicate that it is not desirable that a diabetic and a non-diabetic person should share the same bed.

OBESITY

"The development of fat constitutes a disease when it interferes with the function of some organ or organs."

Ætiology.—1. *Heredity.*—In some families there are generations of fat people. These persons seem to grow more and more obese as they grow older, and the treatment is very unsatisfactory unless rigidly carried out. We must not, however, overestimate the hereditary tendency.

2. *Modes of Life.*—Bad habits of life are probably the most important of all the causes. The habit of overeating, particularly of carbohydrates and fats combined with alcoholic beverages, especially beer, is most pernicious. With this overeating, a lack of exercise, as is usual in a sedentary life, and oversleep prevent oxidation and fat accumulates.

3. The sexual relations seem to offer a predisposition to fat accumulation. At puberty, at the menopause, and after atrophy or removal of the testes or ovaries we see individuals grow stout.

4. Congenitally small lungs, making a defective oxygenating capacity, have also been mentioned as a cause. As people get adipose they are inclined to be less active and to take less exercise on account of the difficulty in getting about, and the fat accumulates more rapidly.

Pathology.—We should distinguish between fatty degeneration and fatty infiltration, which is the condition we find in obesity. In fatty infiltration, which is not necessarily a pathological condition, there is simply an excessive deposit of fat in the cells where normally fat is found. As this accumulates we observe the puffy cheeks, the pendulous breasts and abdomen, the massive buttocks and thighs, and the coarse, greasy epithelium which are so unpleasant to see. Within the thorax and abdomen, about the heart and kidneys, and in the omentum this increase in fat may be enormous. Fatty degeneration is a term used to indicate the process of decay, a fatty breaking down of the albuminates within the tissue elements themselves.

Symptoms.—There seem to be two forms of obesity, plethoric and anæmic. Plethoric obesity is more common in men, and seems the result of a general overnutrition. After the general infiltration of all parts of the body with fat, we ultimately observe hypertrophy of the heart and arteriosclerosis. Then occur the derangements of circulation in different parts of the body, dropsy, cardiac asthma, cerebral hyperæmia, vertigo, tinnitus aurium, and throbbing of the arteries. A sudden increase of arterial pressure may cause rupture of a cerebral or meningeal vessel.

Anæmic Obesity.—In this form we observe the symptoms of anæmia and those of obesity. It is more common in women and children, and the blood is always impoverished. Obesity may be extreme, and we note the fatty masses and the flabby, feeble, and ill developed muscles. The heart muscles also become flabby, and there is a small, feeble pulse from its diminished activity. There is a great incapacity for exertion, palpitation of the heart and dyspnœa resulting from the slightest exercise. These patients are more seriously ill than those who are obese from plethora. They are not gross feeders, nor always are they large drinkers. They usually prefer carbohydrate food, often having an aversion to animal food. This adiposity may be established before full growth, after menorrhagia, after severe hæmorrhage from childbirth, and after severe exhausting illness or full mercurial courses. Dropsy is commonly associated with this form.

Obese people are ill adapted to withstand any acute diseases, especially fevers. There is a progressive failure, unless a rigid and yet not too exhausting treatment is intelligently pursued. There ensue heart failure, bronchial catarrh, emphysema, gastroenteric catarrh, gastrectasis, fatty liver, greasy skin, comedones, greasy warts, eczema, erythema, and intertrigo, furunculosis, and with a use of alcohol to excess we observe rosacea and hypertrophy of the nose.

The causes of death may be cerebral apoplexy, cardiac failure, angina pectoris, or uræmia.

Treatment.—The aim of all treatment is to prevent the ingestion of new supplies of fat and to promote oxidation. Some people do not get fat by forced feeding, and others do not get lean by underfeeding. There must be some factor influencing metabolism outside of lack of harmony between the quantity of food and spent energy. Perhaps the factor is suboxidation.

PREVENTIVE.—Enforce habits of strict temperance in foods and drinks and an active life, both bodily and mentally. In hereditary tendencies, these principles must be insisted upon most rigidly. A seaside residence with sea bathing is an excellent preventive.

DIETETIC.—We may get remarkable results by regulating the diet. In general we withdraw a large part of the fat-producing articles. If we take away all of the fat and fat-producing food, the system suffers in various ways, so we allow small amounts. Fluids in large amounts should not be allowed, and the patient should be told to drink but very little at meals, reserving the time two hours after eating for the fluids. The "cures" established at Carlsbad, Marienbad, Kissingen, etc., depend, not alone upon the mineral water, but upon the diet and modes of life. The life of patients at such places can be much better arranged than it could be in their homes and during the management of their business affairs. In treating cases we first weigh the patient, then make a careful physical examination, noting the condition of the muscular walls of the heart, the state of the arteries, and the urine. Hereditary tendencies, habits, the plethora or anæmia, and the gouty or hæmorrhagic proclivity must be considered. The presence of glucose in the urine and the output of urea, in addition to the foregoing, teach us in how radical a treatment we may indulge. The various systems of diet based upon the caloric demand for maintaining metabolic equilibrium are discussed in the chapter on Nutrition and Diet and in the article on the Fat Laden Heart in Obesity, to which the reader is referred.

Many dietaries have been written and used in different cases, but the observant physician must make out a diet to suit his patient. The following is a specimen:

Six to eight ounces of hot or cold water half an hour before breakfast.

Breakfast.—One to two ounces of toasted stale bread without butter, broiled white fish, mutton chop, beefsteak or cold chicken, game, beef tongue or lean ham. One or two small cups of tea or coffee with a little skimmed milk and no sugar. Saccharin may be used for sweetening.

For weakly patients we may allow six ounces of bouillon or clear soup with a gluten or almond biscuit between breakfast and luncheon.

Luncheon.—Cold meat, poached egg with spinach, lettuce, water cress, or other green vegetables, or a small omelette. A small amount of crust of bread or hard biscuit and a small amount of butter may be allowed. A glass of Bordeaux or Moselle wine (dry) may be taken with as much water. In the afternoon we may allow a cup of tea or a little skimmed milk and a gluten biscuit.

Dinner.—No soup as a rule, although occasionally a little thin consommé may be allowed. A little broiled or boiled fish, without starchy sauces, oysters or caviar, broiled or roasted meat, mutton, game, fowl with a very small portion of fat, green vegetables, no potatoes, and some stewed fruit flavored with saccharine or rendered less tart by adding half a teaspoonful of Rochelle salt. Two glasses of claret or a dry Moselle diluted with water may be allowed.

Before going to bed, a cup of hot weak tea without milk, or as much hot water, should be taken.

Regular exercise must be insisted upon—walking, riding, bicycle riding, or moderate gynasium work. The amount is to be regulated by the effect upon the heart. Oertel's system of exercise consists in climbing elevations, such as hills and mountains.

The drinking of a glass of Kissingen water one hour after meals, and Vichy at the same time on alternate days, has, in addition to diet, been very beneficial in reducing fat.

Thyreoid extract has been found to be highly beneficial in some cases, probably by assisting oxidation, but it is not yet known in which class of cases it can be used with impunity. The effects must be watched as carefully as in myxœdema. The dose should be small to begin with, one grain, and if no bad effects are noted, it can be increased to five or seven grains three times a day.

SCURVY, SCORBUTUS, IN ADULTS

Definition.—Scurvy may be looked upon as an acquired hæmorrhagic diathesis due to chronic ptomaine poisoning from intestinal putrefaction, causing mental depression, extreme debility, a tendency to syncope, and special lesions of the mouth, skin, and muscular system indicative of a morbid change in the composition and properties of the blood. Recent investigations prove that ptomaines derived from tainted animal food are potent factors in scurvy, or that it is due to an infection of the mouth with microorganisms. It is sometimes sporadic and sometimes epidemic or endemic in its occurrence. It was formerly prone to attack armies, the inhabitants of besieged cities, and especially seamen. To-day endemics are by no means infrequent, though much less extensive than formerly. They are most apt to occur in prisons or similar institutions and in barracks.

Scurvy is due directly to a defective quality of food associated with privation. The want of fresh vegetable matter in the diet is *not the prime* factor, as was formerly supposed.

The manifestations of scurvy, especially those of cachexia, may be much favored, though not directly caused, by conditions disturbing the maintenance of good health and impairing physical vigor. Among such indirect causes are exhaustion by hard work, poor diet, previous disease, bad air and water, overcrowding, deprivation of sunlight, monotous diet, damp and unfavorable quarters, cold moisture, persistent heat, excessive muscular exertion, and an almost exclusive use of salt meat.

On shipboard, debility from previous disease, especially from dysentery and malarial fever, often plays an important part. Sudden transition from heat to cold, or extreme cold, may bring on the first symptoms.

Mortality.—The death rate, even in the very bad cases, may be remarkably low, as the disease is wonderfully amenable to treatment.

CAUSE OF DEATH.—Death in syncope is not infrequent. It may result from extreme weakness, from preexistent disease, or from a complication with dysentery, malarial disease, progressive cachexia, pneumonia, pericarditis, cerebral hæmorrhage, or some other intercurrent disease.

Night blindness seen in scurvy patients is believed to be due to exhaustion of the retina—a local symptom of the general debility.

The pictures of the advanced and malignant cases most often occurring on ships, which we very seldom see nowadays, owing to our knowledge of its ætiology and methods of preventing it, are handed down both in medical works and in secular history. Nothing can be more disgusting, and although the treatment and prevention are very simple, it is a triumph in medicine that we have no more of this formerly unduly prevalent and loathsome disease, which through ignorance was attended with such high mortality.

Symptoms and Diagnosis.—As a rule, the diagnosis is not difficult. The pulpy and swollen gums and the subcutaneous indurations are not characteristic of any other disease. Usually the symptoms are seen in a number of people living together, who have had insufficient diet and partaken of tainted meat. The clinical phenomena regarded as characteristic of scurvy are the multiple lesions of the skin, gums, muscles, and bones and involvement of some of the viscera; the occasional sudden and brief attacks of fever followed by equally sudden and abundant effusion into the pleural cavity or the pericardium.

ORDINARY MILD ATTACK.—Scurvy comes on usually slowly and insidiously, the external lesions being preceded by extreme physical weakness and mental apathy, indicated by shortness of breath, a sense of thoracic oppression, fleeting pains in the back and lower limbs, and a peculiar sallowness of the skin.

As the disease advances, the patient becomes listless and weary and the skin grows dry and rough and marked by small purple spots (petechiæ), which are most abundant on the thighs and legs, sometimes being seen only on the lower extremities. Livid patches of varying size, resembling bruises, also appear. Subcutaneous swellings develop most frequently in the soft parts of the calf, in the ham, and behind the ankle. They are firm, widely diffused, not well defined, and very tender. The eyelids are slightly swollen and the conjunctivæ often marked by bright red ecchymoses. Sometimes the lids become purple and swollen, and the conjunctiva appears "tumid and of a brilliant red throughout."

The gums are soft and vascular, much swollen, and of a deep red color. The lips are anæmic and the tongue is moist and clean. A characteristic odor is noticed in the breath. There is dyspnœa upon exertion. The appetite is fair and the patient sleeps well. The urine is scanty and the bowels are constipated.

The most characteristic symptom is the appearance of petechiæ. They are smooth, level with the skin, persist under digital pressure, and consist of a circumscribed effusion of blood around a hair follicle.

On board ship, particularly among colored men of the crew, it might be difficult to distinguish an outbreak of *beriberi* from one of scurvy. Many of its symptoms resemble those of scurvy. They both are cachectic diseases causing much muscular weakness; both give rise to severe muscular pains, dropsy in the lower extremities, breathlessness, and sudden death from syncope.

Differential Points.—BERIBERI presents in general no petechial spots or livid patches, but these are signs in colored people difficult to make out. However, in beriberi the *gums* are not *swollen*, the œdema usually begins in the *front* of the *tibia* instead of in the *ankles*, as in scurvy, and generally there are decided symptoms of peripheral neuritis, such as numbness and paresis of the limbs and tenderness along the course of the nerves. There is at first sight a strong resemblance between *purpura*, particularly Werlhoff's disease, and scurvy.

PURPURA is not due to any special defect in diet or relieved by an increased supply of antiscorbutics. It is characterized by plethora rather than anæmia, and shows a marked tendency to epistaxis and bleeding from the internal organs; it affects chiefly the mucous membranes and the skin, while the muscles, bones, and subcutaneous soft parts remain free; there is no swelling of the gums, and the ecchymotic spots are more vivid and more generally diffused than those of scurvy.

HÆMOPHILIA is a chronic affection of a congenital and hereditary nature, met with mostly in young people, and presenting hæmorrhages from time to time, usually after some injury.

LEUCOCYTHÆMIA in rare instances presents a hæmorrhagic swelling of the gums, but it shows *glandular enlargements*, a *large spleen*, and an excess of *leucocytes* in the blood, which scurvy does not.

PERNICIOUS ANÆMIA is more *chronic* in its course, its waxy pallor is quite different from the sallow hue in scurvy, and examination of the blood is convincing.

SPLENIC ANÆMIA, a rare disease, differs from scurvy in being accompanied by a greatly enlarged spleen, a constantly elevated temperature, hæmorrhages usually of an oozing nature, sometimes profuse, and frequently epistaxis, but hæmoptysis, hæmatemesis, hæmaturia, and hæmorrhage from the bowel are rare. The petechiæ which sometimes occur are very small and are most often seen in persons who are not confined to bed.

ACUTE ULCERATIVE ENDOCARDITIS has its rapidly fatal advancement and its temperatures to distinguish it, although the petechiæ and hæmorrhage may resemble those of scurvy.

The **prognosis** is favorable if the attacks have not lasted long, if there are no visceral complications, and if antiscorbutics can be supplied at once and the patient placed in hygienic surroundings. *Fluid* in the pleural or pericardial sacs is of serious import, although it usually disappears rapidly with general treatment. Dysentery is a serious complication, and if not fatal much retards recovery. Care should be exercised not to give too favorable an opinion, as at any moment a moderate muscular exertion might produce fatal syncope.

Prophylaxis.—A full and mixed diet. For adults on land this is seldom difficult to obtain, except in war. On long sea voyages it is particularly necessary to have preserved vegetables and fruits. Lime juice has been used for some years, but it has a tendency to deteriorate and become distasteful. Even though fruits and vegetables can be preserved so well nowadays, they are inferior to fresh products.

An antiscorbutic list of foods contains fresh potatoes, cabbage, carrots, milk, malt liquors, light wines, tea, and cider. These beverages are remarkable for the large amount of potash they contain in combination with organic acids. Alcohol acts as an antiscorbutic in small amounts, and as a contingent cause of scurvy in large amounts.

Other hygienic conditions must also be looked after; the meats should be fresh or well preserved; extremes of heat or cold are to be avoided; moderate exercise should be indulged in; and suitable clothing and good ventilation are necessary. All perishable food should be sterilized and kept in hermetically closed jars. Such precautions were taken by the Arctic explorer Nansen on his voyage in the *Fram*, as reported to the writer personally by him.

Treatment.—If no complications arise, the treatment is to simply supply the proper food, restore strength, and relieve the more severe local lesions. Proper diet will relieve even the severer symptoms, such as pleural and pericardial effusions. Care must be taken to avoid such articles of food as would intensify a complication, particularly dysentery, and to keep the patient in the recumbent position to prevent death from syncope.

The diet should consist of a free supply of fresh vegetables (potatoes, green vegetables) with oranges and other succulent fruits and eggs, fresh milk, strong soups, and beef tea; as the health improves and the digestive organs become stronger, chicken and lean meat may be added. Medicine is usually not necessary, but lime juice and lemon juice should be administered.

Dysentery and diarrhœa require medication, and occasionally the effusions must be aspirated. The gums may be touched with solid lunar caustic or copper sulphate or washed with a 10 per cent solution of alum in water. The ulcerations should receive antiseptic treatment. The petechiæ gradually disappear, and the indurations, if persistent, may be treated by gentle massage or bandaging and compression.

For scurvy in children, see the section on Pædiatrics.

DERANGEMENTS OF THE DUCTLESS GLANDS

The pathology of the ductless glands embraces (1) functional and transitory disturbances, (2) inflammatory conditions due to infection, (3) the results of trauma, (4) parasitic invasion, and (5) tumor or cyst formation. As a result of faulty internal secretions, we observe various clinical manifestations due to faulty metabolism and catabolism.

THE THYREOID GLAND

The group of ailments depending upon diminution or absence of functional activity of the thyreoid gland may be best classified into: 1. Myxœdema. 2. Sporadic and epidemic cretinism.

Myxœdema

Myxœdema was first defined in 1873 by Sir William Gull as "a cretinoid state supervening in adult life in women."

This disease with its characteristic features and symptoms is probably caused by the loss of function of the thyreoid gland. If the gland is congenitally absent, or the loss of its functions occurs before puberty, we call the disease *cretinism*. If the symptoms arise through operative removal of the gland, we call it *operative myxœdema*, or *cachexia strumipriva*.

Symptoms.—It is more common in women, men contributing only about 10 per cent of the cases. There is such a similarity of appearance and symptoms among the patients with this disease that they look as if they belonged to the same family. There are symptoms which we see in every case, and a few accessory symptoms which we sometimes see in advanced cases. There is a marked general increase in weight, due partly to a firm thickening of the skin which is more than swelling and is unyielding to the touch. It does not pit upon pressure. It is very dry, in parts rough and scaly, and perspiration is absent or scanty. The swelling is not evenly distributed, there being a tendency to padlike formations in the supraclavicular regions, in the axilla, and in other parts of the body. The eyelids are greatly thickened, as are the eyebrows, which overhang the orbits. Both lips are swollen and the base of the nose as well as the alæ nasi are broadened.

The face is pallid, except over the malar region, where there may be a faint pinkish blush. The character of the face is at once heavy and dull.

The swelling and obliteration of the natural folds of the skin cause a lack of expression. The hair loses its natural gloss, becomes fragile, rough, and scanty, and falls out, leading almost to baldness. The ears may become very prominent. The hands, called "spadelike" by Gull, are broad, and the fingers are much flattened. Their movements are slow and awkward, and the tactile sensations are received slowly.

The mucous membranes are similarly swollen. The teeth degenerate, decay, become loose, and fall out. The speech is so altered and characteristic that the diagnosis may be made by hearing a patient speak. The words come slowly and the voice is monotonous and of a "leathery timbre" and expressionless. This is due to the swollen condition of the throat and lips, and probably also to a nervous disturbance. The gait is typical of the disease.

The mental condition is characterized by slowness in thought, perception, and answers and by a poor memory. In the psychical symptoms we see a difference in the different patients. Some are exceedingly garrulous, much of their language being senseless and repetition. Some are taciturn. All are inclined to be irritable and suspicious, and exceptionally they are suspicious of self to such a degree as to lead to delusions, hallucinations, acute or chronic mania, dementia, or melancholia. Such patients must be watched. There may be abnormal subjective sensations, as of taste and smell, and there may be occipital pain. A marked change in temperament is occasionally observed, a peculiar persistence in ideas and deeds which no one can modify. Tremors and contractures of the hands and feet are sometimes seen. All the symptoms are ameliorated in warm weather and intensified by the cold. The patients are exceedingly susceptible to cold, and their temperature is usually subnormal. The urine is ordinarily reduced in quantity, with no change in specific gravity. It contains, as a rule, no albumin or sugar, but the urea is slightly diminished. Menstruation is regular, but the amount of blood may be excessive. Pregnancy and parturition may take place after a woman has become affected with the disease, but hæmorrhage is to be dreaded. There is a tendency to hæmorrhage apart from parturition, and the extraction of a tooth is quite often followed by considerable bleeding.

Pathology.—The thyreoid gland may be absent, atrophied, or enlarged. If it is enlarged, the tissue is changed, either by a new growth or into fibrous tissue. Microscopically, the skin which is so swollen shows that the connective tissue is infiltrated with an almost transparent or faintly granular material. This change may be found in all parts of the body and organs.

Prognosis.—Untreated myxœdematous patients, although they may live many years, gradually get worse and die of inanition, in coma, or with signs of bulbar affection. A few have died from cerebral hæmorrhage. Tuberculous affections are among the most frequent of the intercurrent fatal diseases. A chronic nephritis may be the cause of death.

Treatment.—The introduction of the thyreoid gland of the sheep into our materia medica has revolutionized the treatment of myxœdema, and if it is given before the disease is too far advanced, we effect cures, although most patients have to take it in small doses for the rest of their lives. We begin with small doses of the powdered gland, gr. iij or less, and increase to gr. xv or more a day. An overdose causes a rapid pulse and other symptoms of poisoning. It is highly important that the patients should be kept warm. Winter should be passed in a warm climate if possible. Hot baths, friction, and massage may be of much good. Jaborandi or pilocarpine may be used to increase the action of the skin.

Hypothyreoidism

This term has been used to designate a group of symptoms associated, not with actual cessation of the thyreoid function, but with insufficient function or inhibition of glandular secretion. Such patients suffer from weak and rapid heart, persistent headache, and, if they are women, from menorrhagia. Obesity in children has in some instances apparently been due to thyreoid insufficiency. In both classes of cases the use of thyreoid extract has proved of decided benefit.

Cretinism (Congenital Myxœdema; Myxœdema of Childhood)

This is a condition allied to myxœdema or identical with it, associated with imperfect development of the body and intellect, supposed to be due to absence of the thyreoid gland or lack of functional activity in that organ. There are two forms, the *endemic* and the *sporadic*.

Endemic cretinism arises under local conditions, not understood, associated with goître. It is met with chiefly in Switzerland and parts of France and Italy.

Sporadic Cretinism.—Various causes have been invoked for congenital absence of the thyreoid or for its failure to perform its function. Among these are consanguinity between parents, a family history of alcoholism, family tuberculosis or syphilitic disease, and mental shock and worry during pregnancy. There is sometimes a family history of deformities. The symptoms may develop after an acute fever. In the majority of cases we can discover no cause.

Symptoms of Cretinism.—The symptoms usually appear during the first year, sometimes not until the children are two or three years old, and occasionally not before the eighth or ninth year. The appearance of cretins is most characteristic. The body may be so dwarfed as to give children of fifteen years the appearance of being two or three. The legs are bowed and the extremities, including the fingers and toes, are short and stumpy. The skin is thick and boggy, as in myxœdema. The head seems large for the body; the fontanelle closes very late, having been observed open in adult life; the forehead is low, the base of the nose is broad, the eyes are widely separated and set deep in a seeming furrow extending horizontally across the face; the lips are thick, the mouth gaping with the tongue protruding between two rows of carious teeth; the cheeks are baggy; the hair is coarse, straight, and usually light colored; and the teeth appear late and are apt to decay early.

Fatty tumors of about the size of a hen's egg are frequently seen in the supraclavicular region, in the axillæ, and in other parts of the body. The neck is short and thick, and in some cases there is a depression in the place where the thyreoid should be. The *abdomen* is large and pendulous, resembling the rhachitic abdomen. The voice is rough and hoarse. The skin is dry, perspiration is scanty, and eczema is frequently seen. The patients seldom walk until they are five or six years old, and then the gait is a clumsy waddle. They have a marked mental and physical torpor, being usually idiots. They learn to talk late, sometimes never learning. They are very sensitive to cold, as are the myxœdematous patients, and the temperature is usually subnormal. They are usually dull, placid, and good natured and seldom make trouble. Occasionally we see one who is vicious and has fits of ill temper and despondency. A cretin of fifteen or eighteen years may act like a child of two or three years. They suffer with chronic constipation, and the sexual instinct does not develop.

There are three degrees of cretinism:

1. Cretins manifesting only vegetative functions and deprived entirely of reproductive and intellectual faculties, including the power of speech.

2. Semicretins, possessing the power of reproduction and some faculty of speech, the intellectual faculties being limited to perception of their corporeal wants.

3. The "cretinous," having intellectual faculties superior to those of the semicretins and able in some degree to engage in trade and other employments.

Pathology.—The thyreoid gland may be entirely absent, there may be only a few fatty granules in its place, or it may have undergone cystic or fibrocystic degeneration.

The **diagnosis** is usually easy when one has seen one case. We must distinguish cretinism from the various forms of idiocy that are not associated with thyreoid affections and from rickets and fœtal chondrodystrophy. The condition of the hair, skin, and teeth, the stunted growth, and the characteristic facies are usually sufficient diagnostic points.

Treatment.—The treatment is the same as for myxœdema. The thyreoid powder is to be administered, beginning with gr. j three times a day, gradually increasing according to need and toleration. If overdoses are given, symptoms of Graves's disease supervene. Usually the little patients become as well physically and mentally as their more fortunate contemporaries, but occasionally, although the physical condition may reach normal, the mental state is unimproved. As soon as the normal condition is reached, the dose should be gradually diminished until the minimum dose that will prevent recurrence is known. Protection from the cold, baths, diaphoresis, etc., are aids as in myxœdema. Thyreoid grafting has not given favorable results. (See also Pædiatric Section, page 227 and 228.)

Basedow's Disease (*Parry's Disease; Graves's Disease; Exophthalmic Goître*)

It is a disease characterized by tachycardia (rapid action of the heart), enlarged thyreoid, exophthalmus, and muscular tremor.

Ætiology.—It is most common between the ages of sixteen and forty, and occurs in women more frequently than in men. In men the disease seems particularly well marked and more severe. It may run in families in which there is a neurotic tendency, and several successive generations may furnish one or more cases. Among the exciting causes we may note a *fall*, a *blow*, a *fright* or other severe *mental shock*, worry, intense *grief*, *overfatigue*, *prolonged mental strain*, and acute disease, such as *influenza*, *quinsy*, and *rheumatism*. It has followed *epistaxis*. It may occur after *pregnancy*. *Anæmia* may precede it, as may also *menstrual disorders*. It may be associated with *epilepsy*, *chorea*, *hysteria*, *diabetes*, or *insanity*.

Pathology.—It would seem as if supersecretion of the thyreoid gland were at the bottom of the symptoms, as the administration of thyreoid extract in large doses to healthy individuals causes the same symptoms and from the fact that in myxœdema, where there is absence of the thyreoid, just the opposite symptoms are present.

Symptoms.—There are cases which are developed rapidly and follow a rapid course. Much more frequently the development and course are gradual. Four symptoms are characteristic.

HEART SYMPTOMS.—*Tachycardia* is the first symptom developed, the most constant, and the most important. The pulse varies from 90 to 160 and may be higher. The impulse against the chest wall is very noticeable to the patient and to the observer. The throbbing of the carotids is prominent, and there may be visible pulsation of the peripheral arteries. A capillary pulse is easily demonstrated. A well marked venous pulse is sometimes observed. Irregularity in the heart's action is a late symptom, and indicates a severe and serious condition. Murmurs at the apex and base are usual. The heart sounds may be so loud as to be heard at some distance from the patient.

THE GOÎTRE.—The enlargement of the thyreoid in one lobe, or a general enlargement, is the next important symptom. It is usual, but not constant. At first it is soft, but gradually becomes harder. A thrill may be felt upon palpation, and a systolic *bruit* or *venous hum* may be heard upon auscultation.

The EXOPHTHALMUS is less constant than the preceding two symptoms, and develops later. There are different degrees of protrusion, and it is sometimes so marked as to give the characteristic staring, startled, frightened aspect. Occasionally the eyes protrude so much as to make voluntary closure of the eye impossible. The exophthalmus may be one sided, or uniocular. When the upper eyelid does not move downward synchronously with that of the other eye, we speak of *von Graefe's sign*. It is present in Basedow's disease, but it is also seen in other maladies. The term *Stellwag's symptom* is applied to an increased retraction of the upper lid into the palpebral fissure and the "diminished frequency and incompleteness of winking under reflex stimulation." It is usually present.

TREMBLING.—There is a fairly constant muscular tremor, first affecting the hands and afterward becoming general. Excitement and the erect posture make it more prominent. The finer movements, as in writing or sewing, are impaired.

NERVOUS SYMPTOMS are common. There may be hysteria, neurasthenia, irritability of temper, excitability, restlessness, and depression which may advance to melancholia. A temporary mania is occasionally seen. The normal temperament is often perverted, and the patient may become spiteful, suspicious, and untruthful. Neuralgic pains may be very annoying, and when they are præcordial they simulate angina pectoris. In a few cases the symptoms of general paresis have been observed. Headaches and insomnia are usual. The digestive system is frequently disturbed. There are diarrhœa, flatulence, and vomiting, with pain simulating the gastric crises of locomotor ataxia. The appetite and thirst may be capricious.

Flushes of the skin alternating with pallor may be very annoying. Pigmentation of the skin, as in Addison's disease, and leucodermic patches are sometimes seen. Sweating may be very profuse. Urticaria and angeioneurotic œdema are common. There may be a slight rise of temperature, but it is exceptional. The subjective sensation of heat may be very marked.

Menstruation is likely to be irregular; amenorrhœa, menorrhagia, and leucorrhœa are frequent. Emaciation may be extreme, but it is proportional usually to the severity of the disease, as is the loss of strength. Dyspnœa in attacks may be very severe. It is supposed to be caused by a sudden increase of pressure of the goître against the trachea.

Death may occur from the malady itself or from intercurrent disease. Sudden death from syncope or circulatory failure may take place even in a patient whom we think is doing well. They may die in marasmus with preceding great emaciation and prostration. Persistent vomiting, diarrhœa and dyspnœa may usher in the termination. In about half the fatal cases intercurrent disease is the cause of death. The commonest of such diseases are pneumonia and bronchitis.

Treatment.—Hygienic management for the nervous phenomena is most essential. Diet, exercise or massage, baths, a cool climate, and avoidance of all excitement, fright, or worry are to be prescribed. Many drugs have been tried, generally with poor results. The anæmia should be treated with iron, which, in combination with digitalis, frequently seems to do good. Strophanthus and various other drugs have been used to slow the heart's action, which is one of the indications for treatment.

Aconite, veratrum viride, ergot, and belladonna have been recommended. The latter, which seems to have the weight of evidence as to its being the best drug, should be administered until dryness of the throat is produced. Small doses of opium have helped in some cases, and bromide of potassium in others.

Protracted rest in bed, with an ice bag over the heart continuously by day and over the lower part of the neck and the manubrium, is to be advised in severe cases. Galvanic electricity, with the anode placed over the cervical spine and the cathode upon some of the peripheral nerves, is recommended. Enteroclysis and fresh air are most important factors in treatment.

In the treatment of Graves's disease with the milk of goats from which the thyreoid gland has been removed, the theory is that these animals develop in their organism a substance which would neutralize the toxine in these patients. Encouraging results have been reported by a number of observers.

Treatment with thyreoid serum (antithyreoidin, Merck) is still in its experimental stage, but should be tried.

Surgical procedures seem to have given the greatest relief, but the danger from the anæsthetic and the frequency of death upon the table should be taken into consideration. One lobe of the gland has thus been removed, the arteries of the gland having been tied.

Goître and Malignant Tumor of the Thyreoid

Goître is a hypertrophic condition of the thyreoid gland. It occurs endemically and sporadically. Sporadic cases are common in this country. Endemic goître in Europe is seen in the mountainous regions of *Switzerland, France,* and *Italy;* in this country, about the eastern end of *Lake Ontario* and in parts of *Michigan.* We do not know why the trouble should arise. We have the following varieties:

1. The *parenchymatous,* in which the enlargement is general and the follicles contain a colloid material.

2. The *vascular,* where the enlargement is due to increased vascularity and dilatation of the blood vessels without the formation of new gland tissue. This is the so called "pulsating goître."

3. The *cystic,* in which the substance of the gland is occupied by cysts. The wells of the cysts may undergo calcareous degeneration.

The enlargement may be general, it may affect one lobe, or it may involve the isthmus alone. The symptoms are due to pressure upon the *trachea* or upon the *veins* or, as some say, upon the *vagi.* This latter has been supposed to be a cause of the sudden death which occasionally supervenes. The majority of goîtres give no symptoms.

Treatment.—It is alleged that endemic goître may be avoided by boiling the drinking water. Change of locality has been followed by a cure. Many drugs have been recommended. Among them are iodine and other *counter-irritants, potassium iodide, ergot,* and the *thyreoid extract.* The treatment of goître with distilled or rain water has been advocated by a number of observers, who report that goître has yielded entirely to this remedial measure, and it may be regarded as certain that pure water has a good effect on the course of the disease. Operative treatment is indicated in severe cases with tumor formation, as also in *malignant tumors of the thyreoid gland.*

THE SUPRARENAL GLAND

Addison's Disease (Morbus Addisonii; Bronzed Disease)

A fatal constitutional disease characterized by *prostration, heart weakness, gastrointestinal symptoms,* and *pigmentation* of the *skin.*

Ætiology.—It is more frequent in men than in women, and usually occurs between the twentieth and fortieth years. The most recent observations indicate that the symptoms are due to a *loss* of function of the *adrenals. Injuries,* such as a *blow* upon the *back* or *abdomen,* have been followed by this disease, *and caries* of the *vertebræ* has preceded the attack. There are some who think that the disease is due to an irritation of the abdominal sympathetic nerves.

Pathology.—The suprarenal glands may have a tuberculous fibro-caseous lesion, which is the commonest condition found; there may be simple absence of the adrenals or a chronic interstitial inflammation with contraction; *syphilitic* disease or *malignant disease* may involve the capsule; blood may be extravasated into the capsule; there may be pressure or inflammation involving the abdominal sympathetic plexus, with no lesion of the adrenals themselves. Degeneration of the semilunar ganglion with pigmentation and a sclerosis of the nerves has been described. Enlargement of the ganglia in cicatricial tissue around the adrenals also has been observed. The *thymus* has been found larger than usual and persistent in some cases. The *spleen* may be found enlarged. When a severe lesion, atrophy, or absence of the adrenals is found at autopsy, and there have been no symptoms of Addison's disease, we may conclude that there have been accessory glands which have supplied the necessary suprarenal secretion. Tuberculous lesions of the adrenals may be associated with tuberculous lesions in other parts of the body.

Symptoms.—There are four important symptoms.

1. PROSTRATION.—About the first symptom noticed is the weakness and intense languor of both body and mind. *Dulness, apathy, listnessness,* and *peevishness* are always present and gradually become more marked.

2. HEART WEAKNESS.—The patient may have frequent attacks of *syncope,* which occasionally are fatal. The heart weakness and the resulting poor circulation seem to give the symptoms of cerebral *anæmia.*

3. GASTROINTESTINAL SYMPTOMS.—The invasion of the disease may be accompanied with attacks of nausea and vomiting, spontaneous in character, which may be persistent and become more and more severe. Retraction of the *abdomen,* with *pain,* simulating peritonitis, has been observed later in the disease. *Anorexia* may be present to a marked degree. *Diarrhœa* is more frequent than constipation. The gastric symptoms are variable in different patients, and also vary throughout the course of the disease. They may be absent.

4. PIGMENTATION OF THE SKIN.—Usually the bronzing of the skin does not occur until after the constitutional symptoms have become pronounced, but occasionally it is the first symptom. This pigmentation, from a yellow to a deep brown, occurs first in the face and exposed parts of the body, where there is any irritation or where there is normally some pigmentation, as about the nipples or genitals. A scattered pigmentation occurs primarily, but the spots may enlarge, coalesce, and become diffuse, so that the patient resembles a mulatto. The mucous membranes also become discolored, and pigmentation scattered over serous membranes has been described. In addition to the above mentioned symptoms, there are usually pain and tenderness in the lumbar and epigastric regions.

Course of the Disease.—The disease is usually of long duration, from one to ten years, but it is occasionally acute, with a fatal termination in a few months. If the bronzing of the skin is absent or very slight, the disease is more severe and the course more rapid. These acute, severe cases show great weakness, fever, vomiting, diarrhœa, and delirium. They may prove fatal in a few weeks.

Diagnosis.—As we see pigmentation of the skin in quite a number of different affections, we cannot make the diagnosis from that alone. *Fainting fits, nausea,* and *gastric* attacks are important symptoms. The tuberculin reaction, found in tuberculosis of the adrenals where no tuberculosis could possibly be suspected, may be an aid to diagnosis.

Prognosis.—Recovery is practically unknown, although it is said that there are a few instances. There may be periods of improvement lasting for many months.

Treatment.—The use of suprarenal extract is indicated in Addison's disease. Some cures have been reported. Some patients are not at all benefited.

Dose.—The gland is usually given in tabloids, three a day. Each tabloid contains one grain of the dried extract, which corresponds to fifteen grains of the gland.

The hygienic life and treatment of the symptoms accomplishes something. If the prostration is profound, the patient should be kept in bed, or heart failure is likely to occur at any time, even early in the disease.

For the *anæmia, iron* may be given in full doses. *Bismuth* may be given for the diarrhœa. As for the vomiting, alleviation may be obtained by the use of *creosote, bismuth, hydrocyanic acid, codeine, ice,* or *champagne. Purgatives* should be most cautiously used, so as to avoid an exhausting diarrhœa. The diet should be light and nutritious.

DISEASES OF THE PITUITARY BODY

Acromegaly

This is a rare disease characterized by an abnormal growth of all of the tissues, particularly in the bones of the hands and feet.

Ætiology.—The cause of the disease is unknown. It begins at about the age of twenty-five, rarely earlier, and has been known to show itself first in the fortieth year.

Pathology.—In the recorded autopsies the *pituitary body* has been found diseased in each case, and in the majority it was *hypertrophied* or the seat of a *tumor*. The *thyreoid gland* has been found hypertrophied in half the cases, and the *thymus* has been persistent in some instances.

Symptoms.—Without real deformity, there is a marked enlargement of the hands and feet, more marked in the hands, which are broad and thick —spadelike. The *bones, muscles, subcutaneous tissues,* and *skin* are all hypertrophied. The whole head is considerably enlarged, particularly from before backward. The face is much deformed. The nose becomes enlarged in all its dimensions, and the *nostrils* are large and broad. The *jaw bones* enlarge more than the other bones of the head, the lower jaw, in particular, causing its protrusion beyond the upper, and marked disfigurement results. The *superciliary ridges* are prominent, the *lips* are thickened, the lower lip protrudes and hangs down, and the tongue may be considerably hypertrophied.

The *spine* usually presents a positive curve, so that the chin may rest on the thorax.

The *thorax* is flattened from side to side and may impede chest breathing, forcing the respiratory movements to be chiefly abdominal.

The *skin* is often warty and thickened, the pendulous parts being particularly thick. The dry, harsh appearance of the skin in myxœdema is not present in acromegaly. The hair becomes coarse, long, and thick. The labia majora and clitoris may be especially hypertrophied.

Sensory and *vasomotor* symptoms of varied character may be present. *Headache* is usually persistent. *Pain* in the eyeballs is common. *Speech* is usually thick and slow. *Blindness*, loss of the senses of taste and smell, cessation of *menstruation*, and *muscular weakness* with excessive *perspiration* are common.

Treatment.—The only treatment from which benefit has been derived has been the administration of the extract of the pituitary glands. Following its administration, relief from the subjective symptoms has been observed, with a relapse when the treatment is withdrawn.

THE SPLEEN

General Remarks

The "spleen dulness" is not a trustworthy landmark, and a trivial enlargement permits of no important conclusions in diagnosis. Enlargement should not be diagnosticated unless the spleen can be felt or an increased area of dulness made out. An exploratory puncture can be done without much difficulty by introducing the needle under aseptic precautions in the interspace between two ribs, directly over and into the splenic dulness.

The spleen is in sympathy with all forms of blood infection, and may suffer from an extension of an inflammatory process of the neighborhood. It shows passive congestion, like the liver, in circulatory disturbances. It may be the seat of *amyloid degeneration, tuberculosis, septic abscesses, infarcts, gummata*, and other *tumors*, such as *echinococcus cysts*, and is chronically enlarged in chronic malarial disease and in *splenomedullary leucæmia*. To elicit the nature of the splenic enlargement, an exploratory incision may be necessary. Cases of primary splenomegaly of unknown origin are reported.

If we find a tumor below the left margin of the thorax, oval, notched, moving with respiration, and lying in front of the colon, it is the enlarged spleen. Over the kidney there is tympanitic intestinal resonance. On careful examination one should be able to discriminate between an enlarged left lobe of the liver and the spleen.

The **movable** spleen in women with enteroptosis is occasionally seen, without symptoms or with the nervous phenomena usually associated with a movable kidney. As in the movable kidney, the pedicle may become twisted and produce alarming symptoms, demanding an immediate operation. A suitable abdominal supporter may hold it in place, or operative interference may be necessary. It has been removed, and it has also been replaced and packed about with gauze to form adhesions.

The spleen may *rupture* from the effects of an injury or very rarely spontaneously in *typhoid* fever and *malarial* disease. It becomes very painful and sensitive; there is internal bleeding; and collapse and death result, unless an arrest of hæmorrhage by operation is accomplished.

The **malarial** spleen is large and hard, and occasionally reaches down into the pelvis. When the *Plasmodium malariæ* cannot be found in the blood taken in the usual way, it occasionally may be discovered in the blood taken by needle puncture from the spleen.

Malignant new growths are rare and fatal.

Splenic Anæmia

This disease was formerly regarded as the splenic form of Hodgkin's disease. It is defined as an idiopathic enlargement of the spleen with anæmia.

The **ætiology** is unknown, and it is not known whether this form of anæmia is secondary to the splenic enlargement or not. Adult males constitute the largest number of patients. Splenic enlargement with profound anæmia is observed in children (see section on Diseases of the Blood).

Pathology.—The enlarged spleen shows atrophy and sclerosis of the Malpighian corpuscles. The lymphatic glands may be slightly enlarged. The blood shows a secondary anæmia.

Symptoms.—There is the gradual development of the subjective symptoms of anæmia, although the patient does not look particularly anæmic. The spleen is very large, often reaching as far as the umbilicus. This enlargement in some patients seems to precede the anæmia. There have been *hæmorrhages* from the stomach in some cases, and some patients pass blood with their stools. These hæmorrhages may be very severe, almost fatal. *Ascites* may be present, with or without cirrhosis of the liver. The *red blood corpuscles* are diminished, averaging about 3,000,000, and the *hæmoglobin* is relatively low. The *leucocytes* are usually diminished, and there is nothing extraordinary in the proportion of the different forms. Often there occurs a pigmentation of the skin, with subsequent *emaciation* and *weakness.*

Course.—The duration of the disease seems to be from six months to five years or more. Patients may remain in fairly good health during this time, but have occasional hæmorrhages.

Differential Diagnosis.—We have to distinguish this disease from *splenic leucæmia*, *Hodgkin's disease* with a large spleen, *cirrhosis* of the *liver* with an enlarged spleen, and old cases of malarial disease with a large spleen. *Pernicious anæmia* usually has its blood condition to distinguish it. The red blood cells may be similar in both, making the diagnosis difficult. Usually the condition of the blood, associated with the large spleen and the tendency to hæmorrhages, is clearly diagnostic of splenic anæmia.

Treatment.—In general, the treatment is that for anæmia. Extirpation of the spleen has not given satisfactory results. The prognosis is bad, although the patient may live many years in comparative comfort.

CHAPTER XXVII

THE NERVOUS SYSTEM; NEUROLOGICAL MEMORANDA

SYNOPSIS: Remarks on the Clinical Pathology of the Nervous System.—Remarks on the Application of Electricity.—Examination Scheme in Nervous Derangements.—Neuralgias.—Disturbances with Predominating Undue Motion.—Disturbances with Loss of the Power of Motion Predominating.—Disturbances with Loss of Consciousness Predominating—Derangements with Psychical Alterations Predominating.—Vasomotor and Trophic Disturbances.—Meningitis in Adults.—Syphilis of the Nervous System.—Miscellaneous Lesions of the Brain and Cord with Pressure Symptoms, in which Localization and Surgical Aid are Possible.— Remarks on the Sympathetic Nervous System.—Anatomical and Physiological Anomalies.

REMARKS ON THE CLINICAL PATHOLOGY OF THE NERVOUS SYSTEM

THE nervous system stands at the head of psychic and bodily phenomena. When the entire nervous system is disturbed there are general symptoms. When the integrity of individual nerves and ganglia is disturbed there are localized symptoms, as shown in the various *motor, sensory, secretory, reflex, trophic, electrical, and circulatory phenomena.* The pathology of the central nervous system embraces congenital malformations, injury, compression, and circulatory disturbances (such as anæmia, hyperæmia, hæmorrhage, embolism, and thrombosis), acute inflammation, softening, sclerosis, chronic inflammation, syphilis, tuberculosis, carcinosis, parasitic invasion, cavity formation, etc. The lesion may be unilateral, bilateral, or in disseminated plaques. In a broad sense the integrity of the central nervous system depends largely upon a good circulation, provided that the blood contains normal ingredients.

The cerebrospinal nervous system is practically made up of various types of neurones.

There are neurones transmitting nerve energy from the periphery of the body to the central nervous system. These are called centripetal neurones. The others carry the nerve impulse from the central nervous system to the periphery, and they are called centrifugal neurones. In the sensory system of neurones (centripetal neurones) there are usually three or four neurones; in the motor system (centrifugal) there are only two. Our knowledge of the sensory neurones is not complete, so that it is difficult in most cases to recognize by the symptoms, in a lesion of the sensory system, whether this lesion is in the first, second, third, or fourth sensory neurone.

When there is a lesion of the motor system the conditions are different. Here we can definitely state by the symptoms whether the lesion involves the central or peripheral motor neurones. If *central,* there is paralysis of muscles or spasticity of muscles. There is no trophic disturbance as a rule and no disturbance of electrical reaction. If *peripheral,* there are paralysis and trophic disturbance, such as atrophy of muscles, and disturbance of electrical reaction.

The white matter of the central nervous system carries or transmits impulses. The gray matter receives and transmits impulses and may store potential energy to transmit impulses. The gray matter of the basal ganglia is the centre for automatic action.

The gray matter of the spinal or medullary centre is the seat of reflex action. Each lower system is under constant control from above. The symptoms of a nerve lesion will be of a destructive or irritative nature, or show a combination of both.

A *neurosis* is a functional derangement of the nervous system, exclusive of mental derangement, which is called *psychosis. Neuritis* means nerve inflammation. *Neuralgia* means nerve pain.

Liquor Cerebrospinalis.—The brain and cord are surrounded by cerebrospinal fluid, which evidently acts as a buffer to lessen shock and injury. This fluid stands under a positive pressure and contains but little albumin. When pressure and tension increase by reason of inflammatory processes, tumors, etc., the *choked disc* of the optic nerve ranks first in diagnostic importance. When pressure increases to the extent of compression of blood vessels, we observe *symptoms of direct pressure,* such as vomiting, slow pulse and respiration, epileptoid convulsions, and coma.

Direct cerebral injuries, such as concussion of the brain or apoplexy, show the aforementioned respiratory and circulatory disturbances and generally a loss of pupillary reaction. Embolic processes in the brain show about the same symptoms as apoplectic cases.

MOTOR PHENOMENA

Complete motor inability is called *paralysis.* Incomplete motor inability is called *paresis.* We speak of *ataxia, incoordination,* and *athetosis* when there is an uncertainty of movements. The causative factors of such motor disturbances may be psychical or may be due to pressure (tumor, hæmorrhage); or they may be of inflammatory origin (infection by microorganisms or action of toxines); or they may be due to circulatory disturbances in the nerve centres. Motor disturbances may also be due to pathological lesions in the muscle proper. To the latter group belong the muscular dystrophies, muscular rheumatism, muscular trichiniasis, and parenchymatous degeneration of muscle.

Paralysis and Paresis

Paralysis is a loss of motor power more or less complete. It may be associated with sensory disturbances and with muscle atrophy and reflex disturbances.

There are four types, or classes: *Monoplegia* is a paralysis of one limb. *Hemiplegia* is a paralysis of one half of the body. *Paraplegia* is a paralysis of the two lower limbs. *Diplegia* is a paralysis on both sides.

Paralyses may be central as a result of *brain lesion*, as in *hemiplegia*, they may be due to *cord lesions*, or they may be *peripheral*, as from *neuritis* or disease of the muscles.

The **cerebral type of paralysis** is usually unilateral, involving the whole half of the opposite side of the body, including the lower half of the face (possibly with *aphasia*) and *deviation of the tongue* to the paralyzed side. The muscle condition expresses itself usually by *absence of atrophy or wasting*. Another characteristic of brain palsy is the spasticity, or rigidity with exaggeration of reflexes. There is only a slight quantitative electrical change.

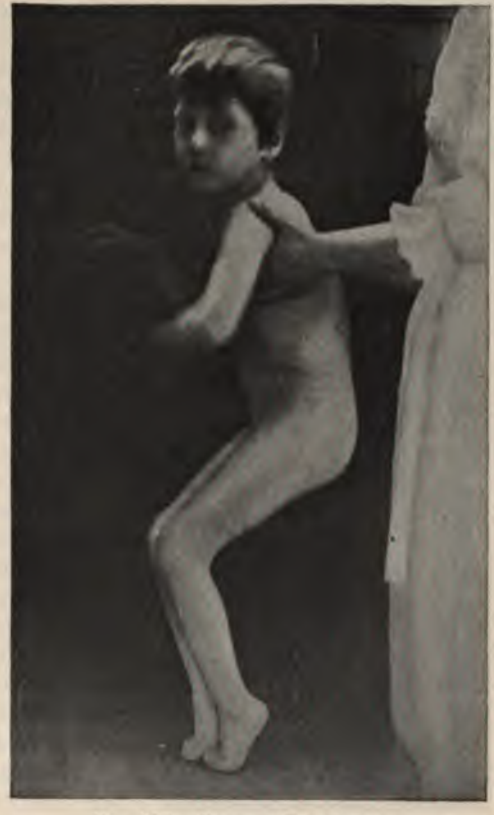

FIG. 210.—SPASTIC PARAPLEGIA.

Spinal paralysis (when the peripheral motor neurone is involved) is characterized by a *wasting of muscle* and, except in myelitis, absence of sensory disturbance. We observe in spinal paralysis flaccidity instead of rigidity and a diminution or loss of reflexes and the reaction of degeneration.

Paralysis Due to Disease of the Nerves in the Course of Their Distribution.—This form may be traumatic or toxic. The traumatic paralyses following dislocation, fracture, and pressure of any kind are generally local, and a return of electrical response, faradic and galvanic, indicates recovery of the nerve. The toxic forms are generally bilateral, with a loss of reflexes and muscular excitability, such as in alcohol, arsenic, and lead neuritis, etc., and in paralysis following infectious diseases (the syphilitic form is irregular in distribution).

Paralysis Due to Muscular Disease.—In this form the changes are in the *muscles themselves*, as in *pseudohypertrophic paralysis* and the *scapulohumeral type of wasting*. In these cases there is probably some congenital developmental defect. The electrical reaction is quantitatively reduced.

Paralysis and wasting of muscles associated with joint affections are of great practical importance. In rheumatoid arthritis there is a bilateral joint affection with enlargement of the bones, and the muscles become so atrophied that the patient resembles a skeleton.

The seat of the disturbance known as *myotonia* (*Thomsen*) and *myasthenia gravis pseudoparalytica* is not definitely known.

Finally, we note motor disturbances due to disease of the bones, tendons, and joints with *intact muscles* and *intact nerve centres*.

Disturbances of *motor coordination*, such as *tabes dorsalis*, are believed to be due to a lack of centripetal impulse and defective or increased reflexes from various organs of special sense. Incoordination may be of cerebral, cerebellar, or spinal origin.

Contractures (Active and Spastic).—Under certain conditions muscles for a time in a state of contracture will continue to be thus contracted and interfere with the free mobility of joints, and contrawise injury to, or lesion of, sensory nerves taking their origin in a joint, will produce contraction of muscles. *Hysterical* contractures are looked upon as of psychic origin.

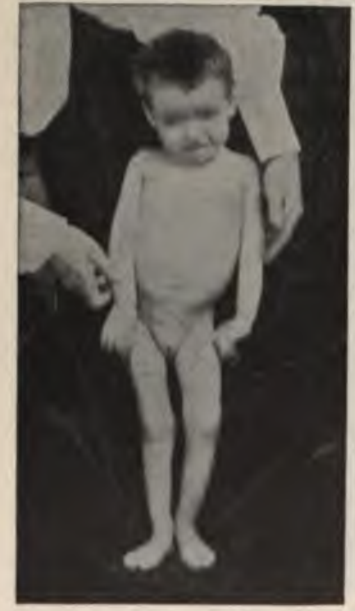

FIG. 211.—MUSCULAR DYSTROPHY.

Neuropathic arthritis and osteitis, supposed to be due to *analgesia* and *anæsthesia*, are observed in cases of tabes, syringomyelia, paralysis, apoplexy, and trauma.

Athetoid Movements; Athetosis.—Lesions in the motor tracts sometimes give rise to clonic spasms with slow, peculiar movements of the fingers and toes which are independent of voluntary action. They are a sequel of hemiplegia and may be mistaken for chorea in children.

Tremors are divided into those which occur during voluntary movements (intentional tremors), those which are constant, but increased by voluntary movements, such as tremors following acute infectious disease, and those which diminish after voluntary movements.

Choreic movements mean sudden jerking and incoordinate movements, *forced movements*, the patient being forced against his will to move in a certain direction.

Associated Movements.—A movement in a non-paralyzed limb causes a movement on the affected side.

Convulsions, or spasms, are tonic or clonic in character. A tonic convulsion is a continuous contraction, as in tetany and tetanus. In *clonic spasms* contraction and relaxation of a muscle alternate rapidly, as in epileptic convulsions.

The symptoms, differential points, and management of a convulsive seizure are discussed in a separate chapter (see also Pædiatrics).

SENSORY, SECRETORY, AND SPECIAL SENSE PHENOMENA

Pain, hyperæsthesia, and paræsthesia are due to irritative lesions i sensory tract. Destructive lesions of the sensory tract result in

1. *Anæsthesia* (hemianæsthesia), loss of tactile sensibility, whi tested by touching the part with a light object.

Fig. 212. — Muscular
trophy.

2. *Analgesia*, loss of sensibility to pain, which is tested by pricking the part with a pin.

3. *Distorted temperature sense*, which is tested by alternately touching the parts with a hot and a cold test tube.

4. *Loss of muscle sense*. This causes an ataxia, or an incoordination, in movements.

Disturbances of localization are dependent upon the organs of special sense.

Secretory disturbances are manifested by an increase or diminution of glandular secretions.

Special Sense Symptoms.—For symptoms referable to the sense of smell, see Rhinological memoranda.

For symptoms referable to the sense of taste, see Digestive disturbances.

For symptoms referable to the sense of sight and hearing and for pupillary phenomena, see Ophthalmic and Otic memoranda.

REFLEXES

The disturbances of reflex action present very complicated conditions, and even in health there is a great difference in the intensity of reflex phenomena. Any irritation of superficial tissues will cause contraction of neighboring muscular elements, viz.: epigastric, cremasteric, plantar, conjunc pupillary, and palatal reflexes. They are distinguished as *skin re* *deep reflexes* (tendons and muscles), *visceral reflexes* (rectum, bladder genital apparatus), and *organic reflexes* (respiration, etc.).

The absence of cutaneous reflexes is not of much clinical signific Examples of reflex activity are sneezing, winking, coughing, a flow of s or gastric juice, vomiting, and blushing. Without these life would The skin reflexes are at present not well understood.

The deep tendon reflexes about the knee and ankle are generally pr in health, and absence of the knee jerk generally denotes a lesion o reflex arc. The author has met with individuals in good health with a knee reflexes, and in some it is a family trait. Great care must be us designating a reflex as diminished or exaggerated, because we hav reliable standard of what is normal. The light reflex should never be looked.

The so called *organic reflexes* preside over *defæcation, urination, sw* *ing*, and *respiration*, and their altered function is of great importance. In strychnine poisoning and tetanus the reflex spasm is due to great irritability of the spinal cord. An alteration of reflex action takes place when the connection between the brain and the reflex centre in the spinal cord is destroyed, but even in health there is a great difference in the intensity of reflex phenomena.

There is a pathologically increased reflex activity due to irritation. Mild irritants and slight causes do not affect the reflex mechanism, else we should be in constant danger. The control of reflexes by the higher centres is important, and a defect therein is the cause of inharmonious reflex activity. Nature directs attention to the seat of irritation by pain and discomfort, and when a source of irritation is not clear, the reflex neurosis is not usually due to peripheral irritation, but to a defect of a higher control from impaired nutrition. *Thus, an increased nutrition of the entire system will counteract cortical exhaustion and cure "womb strain" and "eye strain," for which much unnecessary surgical interference is offered and accepted.* The same reasoning is applicable to convulsive seizures supposed to be due to phimosis, for which the probable underlying cause is usually a weak nervous system.

TROPHIC DISTURBANCES

Trophic disturbances in the various tissues are usually the result of faulty circulation or innervation. When a muscle is so affected, a degenerative atrophy takes place. A most remarkable trophic disturbance of muscular nutrition is known clinically as progressive muscular dystrophy (pseudohypertrophic muscular paralysis), occurring mainly in children.

In the acute anterior poliomyelitis of children the trophic disturbance may be so marked that a retardation of bony growth goes hand in hand with the atrophy of the paralyzed and degenerated muscles. Trophic vasomotor disturbances in the skin and mucosa are the causes of such conditions as urticaria, erythema, bed sores, and herpes zoster. Other vasomotor disturbances are pallor, coolness, congestion, and œdema of the skin.

REMARKS ON APHASIA

Aphasic disorders occur in connection with lesions of the left cerebral hemisphere. We distinguish *motor, or ataxic, aphasia* (third left frontal convolution), *sensory word deafness* (first temporal convolution), *amnesic aphasia* (a failure to recall words), and *aphasia which may be simple or mixed.* In conjunction with disorders of speech, difficulty in reading (*alexia*), writing (*agraphia*), and communication by gesture (*amimia*) may occur. Aphasia occurs commonly with right sided cerebral hemiplegia. *Aphasia without motor paralysis* occurs with small circumscribed lesions or it may be transitory in consequence of circulatory disturbance. Sensory aphasia is not accompanied by motor disturbance. Aphasic disturbances may be improved by attempts at speech, exercise, etc.

PSYCHICAL CONDITIONS

In the *emotional sphere* we observe changes of habitual temper, such as irritability of temper, mental depression, and mental excitation.

The disorders of *intellection* embrace dulness, confusion, loss of memory.

Characteristics of the *insanities:* Delusion, an abused or unformed belief, illusions, false interpretation of objects, hallucinations, a sense of perception without a physical basis.

Delirium is characterized by restlessness or incoherence of speech, with illusions and hallucinations. It may be active or wild, as in delirium tremens, low or muttering, as in "typhoid" states. The onset may be sudden or slow. In the beginning of an acute infection it is the expression of profound toxæmia, and as a terminal phenomenon it may express brain inanition from circulatory failure.

Insomnia (*Sleeplessness*)

Patients complain of disturbed sleep, persistent wakefulness, sudden twitching or jerking of the body at the time of falling asleep, etc.

Disturbed sleep has slight diagnostic value, because of its occurrence in slight as well as serious ailments in neurotic persons and from mental or physical fatigue or indulgence in tea, coffee, tobacco, etc.

Disturbances of consciousness, according to their degree or severity, are termed somnolence or lethargy, stupor or coma.

In *coma* there is the condition of insensibility from which we cannot arouse the patient.

The differential diagnosis and treatment of coma are very important, and are described in a separate chapter (see Coma).

FAMILIAR POINTS IN CEREBRAL LOCALIZATION

In the cerebral corticomuscular region is the centre for the leg, arm, and facial nerves. The cortex of the frontal portion is associated with thought and intelligence; the right and left temporal lobes contain the cortical radiation of auditory nerves. The occipital portion contains the cortical radiation of the optic fibres. The left temporal lobe is the sensory speech centre.

Internal Capsule.—Hæmorrhage into the internal capsule is a common disorder, resulting in paralysis of the facial and hypoglossal nerves, in paralysis of the arm and leg upon the other side, and sometimes in cutaneous anæsthesia.

Disease of the Cerebral Peduncles.—This disease results in cerebral hemiplegia with alternate oculomotor paralysis.

Disease of the Pons.—Hemiplegia with alternate facial paralysis.

Base of the Brain.—When disease of the base is associated with inflammation, thickening, and neoplasms, the cerebral nerves are compressed and paralyzed. The principal *bulbar symptoms* are derangement of *articulation, swallowing, breathing,* and *cardiac action,* through the hypoglossal, glossopharyngeal, and vagoaccessory nerves.

REMARKS ON THE APPLICATION OF ELECTRICITY

Electrical power may be compared to water power. The force which starts the column of water flowing is gravity, that of electricity is electromotive force (E. M. F.). Electricity flows from a high potential (the positive pole) to a low potential (the negative pole). The zero point is the earth, and the potential is the capacity to do work. The unit of measurement of electromotive force is the *volt*.

Substances through which electricity flows are *conductors* in contradistinction to *non-conductors*, or *insulators*.

The unit of resistance to the electrical current is the ohm.

Ohm's Law.—The current strength is equal to the electromotive force divided by the resistance.

The current strength is measured and expressed in ampères. For therapeutical purposes, we gauge the current strength in milliampères ($\frac{1}{1000}$ of an ampère).

The forms of electricity used in medicine are the constant current (galvanic current), the interrupted current (faradic current), static electricity (Franklinism), the sinusoidal current, and the D'arsonval, or high frequency, current.

The galvanic current is produced by chemical action. The faradic current is produced by induction in a secondary coil surrounding a primary coil in activity, with frequent interruptions. Static electricity is produced by friction and confined by insulation.

Action of the Electric Current upon Living Tissues

Electrolysis is a chemical decomposition of tissues at the electrodes—a process taken advantage of for the destruction of nævi, small tumors, etc.

Cataphoresis is the power of carrying solutions through the tissues in the direction of the current. Cocaine and other drugs may thus be introduced into the body.

Electrotonus is a modification of the nerve electricity by means of the electric current. At the anode it is lessened (anelectrotonus); at the cathode it is increased (catelectrotonus). A sudden increase or decrease of the current (voltaic alternative) also causes muscular contractions. The galvanic current possesses all these properties in a more marked degree than the faradic current.

A degenerating muscle loses the power of response to *static electricity first*, next to faradic, then to simple opening or closing of the galvanic current, and finally to the voltaic alternative.

Reaction of Degeneration.—1. Loss of muscular contraction to *nerve stimulation* by the galvanic or faradic current. 2. Loss of muscular contraction to *direct stimulation* by the faradic current. Modification (sluggish contraction) of muscular contraction by stimulation with the galvanic current.

Thus electricity may aid us in forming a prognosis, for a complete reaction of degeneration implies a more grave prognosis than a partial one.

ELECTRICITY IN PRACTICE

In medical practice we employ electricity

1. As a tonic.
2. As a sedative for the relief of pain.

3. For diagnostic purposes.
4. For the destruction of tissue.
5. For the production of light and power.

The faradic current is employed for general tonic purposes in central paralyses, as well as in peripheral paralyses when the muscle is but slightly degenerated. In applying the rapidly interrupted current, we place one electrode over the nerve supplying the muscle and stroke the paralyzed part with the other electrode. This method does not necessitate an exact knowledge of the position of the motor points, a motor point being a certain spot in each muscle at which the action of the current is more irritating. One application each day or every other day is sufficient.

For stimulating anæsthetic skin, we make use of a wire brush attached to the faradic battery. Faradization for general tonic purposes is accomplished in the following manner: Groups of muscles are made to contract separately, after which the poles are placed at the nape of the neck and the cheek. Such treatment may be administered daily.

The galvanic current is also employed as a general tonic and in about the same way as the faradic. To influence the nutrition of degenerated muscles, the anode is placed over the supply nerve and the cathode is rubbed over the muscle without breaking the current. To produce muscular contractions, the cathode is placed over the motor point and the circuit is alternately opened and closed at this point.

Static electricity is used for tonic effects by drawing sparks from various parts of the body. An induced static current can also be obtained, and may be used as a muscle stimulant in central paralyses. Vacuum glass electrodes may also be employed in connection with a static machine.

Sedative influences may be elicited by drawing sparks by means of a static current from the painful area or by placing one faradic electrode over the painful area. When using the galvanic current as a sedative, we place the anode over the part to be influenced and the cathode as far away as possible, and we employ a strong current frequently.

In cataphoresis for neuralgia the anode is saturated with a 10 per cent cocaine solution.

In applying electricity, the electrodes must be thoroughly saturated with water; dry electrodes are used to influence the skin. To avoid painful shocks from a strong galvanic current, we should increase or decrease the strength gradually, and to produce muscular contraction we always begin with a weak current.

For electrolysis we employ the constant current, one pole of which is a needle.

The *high frequency current* has been employed to stimulate internal secretions.

EXAMINATION SCHEME IN NERVOUS DERANGEMENTS

In taking the history of a patient with a nervous disease, it is particularly important to inquire into the **family peculiarities and diseases.** We should ask about *neurasthenia, epilepsy, hysteria, insanity, alcoholism, tuberculosis, rheumatism, gout, and syphilis.* The **previous illnesses** of the patient, particularly *syphilis and the infectious diseases,* are important. As to the causes of the **present trouble,** we should inquire about *trauma (injury at birth), fright, and poisoning (lead, mercury, alcohol, and tobacco),* the *gouty diathesis, infectious diseases (scarlatina, influenza, meningitis, etc.), and syphilis.*

Present Illness.—We should ask about headache, vertigo, sleep, tremor, delirium, abnormal disposition, and disturbances in sensation and motion.

EXAMINATION

Motor Power.—In the *examination* we should ascertain the *motor power* as shown by the position of the extremities in repose, an abnormal position, atrophies, and involuntary motions, such as trembling and spasm; *motion,* particularly active free motion, activity with point of resistance, passive motion.

The Face.—We should notice whether both sides of the face are equal, whether the palpebral fissures are the same on both sides, whether the nostrils are equal, whether the mouth is straight or retracted, whether the eyes are equal and held motionless, whether the pupils are equal, whether the patient can wrinkle the forehead, close the eyes, pucker the lips, laugh, fill out the cheeks, extend the tongue and move it to the right or left, what is the state of the movements of mastication, notice the movements of the eyes (to the right, to the left, upward, downward, and inward).

Mouth; Pharynx; Larynx.—Examine particularly the condition of the soft palate and uvula and the ability to move the soft palate when intonating.

The neck should be examined especially as to the position of the head and the ability to move it to the right to the left, forward, or backward (try with a point of resistance).

The Shoulders and Arms.—You will notice as to the position of the scapula, the position in which the arm is held, the posture of the fingers, the thickness of the thenar and hypothenar eminences, and the interosseous spaces; as to the ability to raise the shoulders and arms (to the vertical position), to abduct them, to extend them horizontally, to bend and extend the forearm, to pronate or supinate it, to bend and extend the hands and fingers, to separate the fingers, to bend in the whole thumb, and as to the hand pressure.

The legs will be examined as to the position of the trochanters, concerning the ability to raise, abduct adduct, and bend and extend the knee, ankle, and foot.

The Trunk.—Notice the *respiration,* whether it is the same on both sides of the body; as to the abdomen, whether it is retracted; concerning the vertebral column (shape) and the buttocks (hypertrophy, atrophy); as to bending forward, backward, to the left, and to the right, deep respiration, and cough.

The Reflexes.—Such as the skin reflex, the sole and palmar reflexes, the cremasteric, abdominal surface, conjunctiva, lid, and pharyngeal reflexes, the tendon and muscle reflexes, the patellar and tendo Achillis reflexes, the ankle clonus, the wrist, biceps, and triceps tonus, and the pupil reflex.

Miscellaneous Phenomena

Bladder and Rectum Phenomena. Romberg's symptom. Gait (ability to cross the legs in the prone position, etc.); as to the grasping of objects; as to speech and handwriting; as to the *perceptive faculty*—subjective (deafness, irritation, pain, etc.) and objective; as to skin sensation on stroking softly, on pricking, and on applying heat or cold; as to the *muscular sense*—the ability to move, the field of vision, the hearing, smell, and taste.

THE NERVE CLINIC[1]

NEURALGIAS; PAINFUL TICS; HEADACHE; MIGRAINE

Neuralgia is a name applied to an ailment characterized by pain along the course of a nerve or nerves, which may be of central or peripheral origin, and may be idiopathic or symptomatic.

Ætiology.—The predisposing cause is a neurotic, gouty, or rheumatic constitution. The exciting causes are toxic agents, including autointoxication from the intestine (dyspepsia, constipation), acute and chronic infectious diseases, exposure, overexertion, emotional shock and injury, and direct irritation, as from a carious tooth or tumor. Syphilis, tuberculosis, malaria, diabetes, Bright's disease, tabes, and alcoholism are among the principal underlying causes. Neuralgia may be reflex from the pelvic and other organs.

Forms of Neuralgia

Cervicooccipital neuralgia (neck pain) is not rare. It is more common in women between the ages of twenty and thirty-five. Neck pains occur in migraine, in hysteria, in neurasthenia, from spinal irritation, as a result of eye strain, as a symptom of brain tumor, meningitis, or rheumatic inflammation of the neck muscles and nerves, and often as a reflex of pelvic disease. As a true neuralgia, the pain is usually unilateral, paroxysmal, sharp, and sometimes intense. One may demonstrate tenderness over the exit of the nerves. The disease may last for several weeks.

Cervicobrachial neuralgia is a painful condition of the sensory nerves of the neck, shoulder, and arm. It is rather rare, more common in women, and is produced by the usual causes of neuralgia. There may be an accompanying neuritis with burning sensations. Anæsthesia, vasomotor disturbances, herpes, muscular weakness, and atrophy may be present.

Digital neuralgia, where the pain occurs in a single finger, is sometimes seen. It is often due to a local injury or neuritis. As a reflex it may be due to a remote trouble.

Supraorbital and infraorbital neuralgia is marked by shooting pains and tenderness along these nerves, by painful spots at the supraorbital notch, at the inner angle of the orbit, at the junction of the bone and cartilage of the nose, and over the infraorbital foramen. In protracted cases the hair on the affected side may become gray.

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[1] For familiar forms of nervous derangements in children see also "Pædiatrics."

Supramaxillary neuralgia causes pain referred to the teeth of the upper jaw. A painful point may be elicited at the infraorbital foramen.

Inframaxillary Neuralgia.—The pain is experienced in the teeth of the lower jaw, and painful spots may be found along the auriculotemporal nerve.

Tic douloureux (prosopalgia, Fothergill's neuralgia) is a special form of *trigeminal neuralgia* and is to be clearly distinguished from the ordinary form. It is accompanied by distinct changes in the nerve itself. It seldom occurs in people under forty, and is often seen in the very old. The disease is characterized by intense darting pains, usually starting in the upper lip, by the side of the nose, and radiating into the teeth, into the eye, or over the temple, brow, and head. They occur on only one side of the head. The patient is in great agony during the attack; the face flushes, the eyes water, and the nose runs. After lasting for a few minutes, the pain becomes less, but seldom ceases entirely, and a breath of cold air, speaking, eating, or protruding the tongue may bring on spasms. They are worse in winter. Sometimes the spasms come for several months every year, usually in the spring. The face may assume spasmodic movements with the pain. This form of neuralgia differs from ordinary forms because a pathological condition of the nerve is found (neuritis).

Intercostal neuralgia (side pain) is frequently seen in nervous, hysterical, and anæmic women. In aneurysm, caries, and pleurisy there may be pain along the intercostal nerves. Corset pressure, childbearing, pelvic disorders, dyspepsia, heart disease, syphilis, malaria, and lead poisoning are frequent causes. The attack usually comes on suddenly. The pain is sharp and stabbing and but slightly increased with the respiratory movements. There are points of tenderness at the exit of the lateral nerve branches or over the exit of the dorsal or anterior branch. *Pleurodynia is recognized by not showing any of these tender spots, and by increase of the pain upon breathing.* Herpes zoster may occur with the severe form of intercostal neuralgia. Its course is from two to six weeks, but it may last longer.

Mammary neuralgia (mastodynia) is a form of intercostal neuralgia affecting the anterior and lateral branches of the three or four upper dorsal nerves. It may be a true neuralgia or due to local tumors. Anæmia, pendent breasts, poorly fitting corsets, injury, hysteria, sexual precocity, pregnancy, and lactation are causes. It is often severe, and *middle aged women affected with it worry for fear of cancer.*

Lumboabdominal neuralgia, pain along the upper branches of the lumbar nerves, occurs oftenest in women, and, in addition to the ordinary causes of neuralgia in this region, there may be straining, constipation, and pelvic disease. We find pain in the loins, back, buttocks, down to the hypogastrium, in the inguinal canal, spermatic cord, testis, scrotum, or labium majus. *Painful thigh,* with pain in front of the knee and anterior and outer parts of the thigh, is a common form.

Coccygodynia affects the lower posterior branches of the sacral nerves. Exposure, injury, and parturition are causes. Reflexly it can *be caused by pelvic disease or spinal irritation.* It is most annoying, as it interferes with walking, sitting, and defæcation.

Surgical treatment is rarely needed.

Sciatica, a neuralgia, sometimes a *neuritis*, of the sciatic nerve, is characterized by an intense pain extending down the back of the thigh and sometimes down the leg to the foot.

It is a disease of middle life and it is more frequent in men, being the only form of neuralgia of which this can be said. In addition to the ordinary causes of neuralgia, in this form we recognize as exciting causes constipation, pressure from hard seats, exposure, muscular strain from heavy work, and pressure due to intraspinal or intrapelvic tumors, etc. We sometimes see it in diabetes, phthisis, alcoholism, and metallic poisoning.

Although the pain may be uniformly distributed along the course of the nerve, not infrequently there are spots where it is more intense. These spots are above the hip joint, near the posterior iliac spine, at the sciatic notch, about the middle of the thigh, behind the knee, below the head of the fibula, behind the external malleolus, and on the back of the foot. Pressure usually elicits tenderness along the course of the nerve. Generally the pain is more or less constant and of a gnawing, burning character, but not infrequently it is paroxysmal, being more intense in damp weather and at night. Walking increases the pain. The patient does not straighten his knee, but walks on his toes to diminish tension on the nerve. In severe cases there may be muscular wasting and fibrillary twitchings.

DIAGNOSIS.—We have to distinguish sciatica from rheumatoid and hysterical hip joint disease, organic diseases of the cauda equina, or spinal cord, muscular pains in the hip and leg, and tumors pressing on the nerve.

The PROGNOSIS must be guarded, as some cases prove intractable to treatment and some last for months.

Podalgia is a term used to indicate pain in the feet, of whatever origin. Pains in the feet occur in flat foot, gout, rheumatism, syphilis, tabes, chronic alcoholism, and diabetes. Gouty pains are usually in the dorsum of the feet, alcoholism pains affect the ankle, syphilitic pains are accompanied with nodes.

Plantar Neuralgia.—Occasionally in sciatic neuralgia the pain is limited to the plantar nerve. This condition is probably due to a neuritis. Erythromelalgia is a painful trophic disturbance in the fingers and toes.

Morton's neuralgia is a name given to the pain in the metatarsophalangeal joint of the third and fourth toes which is thought to be due to slight dislocation and resulting pressure upon a nerve. The dislocation may come from injury or the pressure of the shoe. However, it may affect other toes, and may not be due to a luxation. Incipient flat foot may cause it, and it has been seen in pregnancy.

Tarsalgia (policemen's or **bakers' disease)** is a neuralgia probably due to incipient flattening of the foot and stretching of the plantar ligaments. It has been ascribed to other causes. It is observed in people who have been in the habit of going barefoot and then taking a position where much walking or standing was necessary.

General Principles of Treatment of Neuralgias

We should seek to relieve the underlying cause, build up the general health by exercise and cold sponge baths, and treat the pain symptomatically. The nervines, analgetics, and occasionally morphine are indicated. In the less urgent cases it is wise *to begin treatment with a brisk purge.*

Symptomatically, we may give antipyrine, acetanilide, phenacetin, the salicylates, caffeine, the bromide of ammonium, or sodium, and sometimes morphine, codeine, or hyoscine. Local applications of a 20 per cent solution of menthol, hot cloths, ice bags, blisters, etc., are aids. Morphine in neuralgias should be injected over the seat of the pain.

A combination of the various analgetics sometimes acts better than an individual drug.

When *syphilis* or *malaria* is suspected as an underlying cause, mercury, iodide of potassium, quinine, and arsenic are to be administered, and iron in anæmia. Massage and vibratory massage are often useful. In intractable cases surgical procedures are sometimes necessary.

Treatment of Tic Douloureux.—Nitroglycerine, gr. $\frac{1}{100}$ every two hours, gives relief. Aconitine, gr. $\frac{1}{200}$ in repeated doses until the physiological effect is obtained, is probably the best single remedy. Morphine and cocaine injections, galvanism, potassium iodide, gelsemium, croton chloral, codeine, menthol, etc., are all helpful. Tonics and change of air have helped. Vibratory massage may be tried.

Surgical interference may be necessary. Removal of the teeth is usually unsuccessful.

Treatment of Sciatica.—Look for local irritation and the underlying cause, and apply general principles of treatment.

For the *pain*, we may give antipyrine, phenacetin, lactophenin, chloral hydrate, the bromides, and cannabis indica. Subcutaneous injections of strychnine into the nerve or the region of the pain have lately proved a valuable means of treatment. Injections of morphine over the nerve give prompt relief. In some cases the wet pack and dry hot air treatment are curative if employed for several weeks.

The *surgical treatment of sciatica* consists of the stretching—subcutaneous or open—acupuncture, and even excision of part of the nerve. In the subcutaneous stretching the thigh is forcibly flexed upon the abdomen while the leg is kept in full extension. It is without danger and should be tried in every case.

In **pedal neuralgia,** rest, wearing broad soled shoes, and supporting the plantar arch by means of spring soles are indicated. An operation is occasionally necessary.

HEADACHE

Headache (cephalalgia) is a broad term given to attacks of diffuse pain in different parts of the head and not confined to particular nerves. It is common to observe it in paroxysms, but it may be continuous.

Ætiology.—This most common of nervous symptoms is estimated to occur in from 10 to 15 per cent of school children, 25 per cent of men, and 50 per cent or more of women. It may be caused by anæmia and other blood conditions; by gout, rheumatism, diabetes, and uræmia; and in infections, malarial fevers, etc. Toxic cases arise from lead, alcohol, tobacco, or *gastrointestinal toxæmia.* Ætiological *neuropathic states* are epilepsy, neurasthenia, hysteria, and neuritis. *Reflex conditions* are ocular (eye strain), nasopharyngeal, auditory, dyspeptic, and sexual. *Organic disease* may cause it, such as arteriosclerosis, syphilis, tumors, meningitis, and diseases of the cranial bones.

The various **forms** are frontal, occipital, parietal, temporal, vertical, and diffuse headaches. We observe pulsating, throbbing headaches, characterizing vasomotor disturbances and usually indicating migraine.

There are dull, heavy headaches which are typical of a toxæmia or dyspepsia; constrictive, squeezing, or pressing headache, common in neurotic and neurasthenic patients; and hot, burning, sore sensations, common in rheumatic and anæmic cases. The sharp boring pains are seen in hysterical, neurotic, and epileptic cases.

Diagnosis and Differential Points.—It is very important to determine the cause of a headache, and a consideration of the enumerated factors will aid in diagnosis. Dull headaches are to be distinguished from neuralgias of individual nerves and from migraine.

Migraine is paroxysmal, lasts a short time, and leaves the patient well or even better than before. It is often accompanied by nausea, flashes of light, strong pulsations, vertigo, and pallor or congestion of the face.

Neuralgic pains follow the course of a nerve, where sensitive points may be found. They are sharp and shooting in character and are often associated with suffusion of the eye and œdema and with pain on pressure over the affected nerve. In supraorbital neuralgia the pain is *on* the head, *not in* the head.

Neurasthenic "headache" is not a pain, but a *pressure sensation,* though on violent overexertion real pain (exhaustion headache) may occur, as in the healthy. The complaint is often of a band drawn round the forehead; in more severe cases of a lead cap feeling. *"Suggested" headaches* occur principally in morbidly suggestible women, usually arise from slight causes, and are generally associated with complaints of other bodily sensations.

Nodular headaches occur mostly in women of middle life. The pain originates in the occipital and cervical regions and is persistent and violent, and the patients are sensitive to atmospheric disturbances like rheumatics. Examination reveals millet seed to bean sized nodules in the subcutaneous tissue of the occiput and neck.

Treatment of Headache.—When immediate relief is required, it is best to administer one of the analgetic drugs in a full dose (see Treatment of Neuralgia). In less urgent cases a brisk purge may first be administered and an analgetic drug or specific medication, as with quinine, potassium iodide, or iron and arsenic, may be employed subsequently. In neurotic individuals the bromides are usually indicated, together with proper exercise and hydrotherapy. In nodular headache local massage and vibration are to be employed.

Migraine; Hemicrania (Sick Headache)

Migraine is a constitutional neurosis, characterized by periodical attacks of pain, chiefly in the course of the fifth nerve.

Ætiology.—It is often inherited, and is more common in women and members of neurotic families. Rheumatism and gout as latent conditions are known to be causative factors. Reflex causes are *uterine disease, eye* *strain, abnormal conditions of the nose or nasopharynx, and carious teeth.* In young patients we should suspect a reflex origin. The exciting cause may be mental or bodily fatigue, emotions, indigestion, constipation, or some particular article of food. There is a periodicity to the attacks, which usually cease after the climacteric in women and at about the same age in men.

Pathology.—We know nothing as to the pathological conditions. The theory that it is a nerve discharge from sensory centres, a sensory equivalent of epilepsy, seems tenable. Some call it a vasomotor neurosis.

Symptoms.—Many cases show premonitory signs, such as malaise, lassitude, depression, or a sense of chilliness, lasting from a few hours to several days. Visual prodromes, such as hemianopia, spots of dimness of vision or scotoma, apparitions, balls or flashes of light, and zigzag lines are common. There may be a condition of intense emotional activity. The prodromal symptoms are not always present, or they may constitute the entire attack, the headache not taking place or being very slight. Confusion of ideas, a feeling of stupor, depression, and marked disturbances of memory for several hours may exist without the headache and constitute the complete attack.

The most characteristic feature is the violent paroxysmal headache. The pain usually starts in one side of the head, over the eye, but may begin in the occiput. It increases and becomes excruciating, involving one half of the head or, more often, the whole of it. The quality of the pain is tense, throbbing, and blinding, and it is increased by jars, light, and noises. Prostration, although temporary, is extreme. The face may be pale and pinched, and there may be a difference between the two sides. During the attack there is usually mental confusion, with temporary loss of memory. The pulse is small and hard and may be slowed. When the headache reaches its climax, nausea and vomiting commonly appear, and they afford relief. Repeated vomiting causes a regurgitation of bile and bitter vomitus, which has given the affection the improper name of "bilious headache."

The attack varies in length from a few hours to several days. After the patient has vomited and the pain has become easier, he usually falls asleep and awakes much refreshed, and the next day may feel better than before the attack. The attacks occur with considerable regularity, monthly, fortnightly, or even weekly. In women they often occur during menstruation. After a severe attack we may observe small hæmorrhages in the sclera of the eye.

Prognosis.—Although the disease cannot be promptly cured, much can be done to lessen the frequency and severity of the attacks.

Treatment.—Patients are frequently aware of the causes precipitating an attack, and if they are avoided, the paroxysms are much less frequent. In children, after eliminating eye strain, nasal hypertrophies, adenoid growths, enlarged tonsils, etc., we should endeavor to keep them in the best possible health by exercise, proper diet, and freedom from excitement and overstudy. As it has been demonstrated that the attacks are much less frequent during good health, the patient should be built up, the gouty and rheumatic tendencies should be corrected, and the digestive tract be kept in order by catharsis and the administration of dilute muriatic acid.

During the paroxysm, the patient should be put to bed and kept absolutely quiet. A cup of strong coffee often relieves the pain. Antipyrine or phenacetin, in small repeated doses, frequently gives relief. In cases where there is marked pallor, nitroglycerine, in doses of $\frac{1}{100}$ of a grain every two hours, is helpful. Cannabis indica, gr. $\frac{1}{3}$ (Herring's English extract), sodium bromide, gr. xxx, and chloral hydrate, gr. x to xv, are of service. A prolonged course of cannabis indica has been recommended.

General massage and active outdoor exercise are to be advised. In the interval between the attacks the patient should have tonic baths and all forms of tonic hydrotherapeutics.

DISTURBANCES WITH PREDOMINATING UNDUE MOTION OF CENTRAL, PERIPHERAL, OR UNKNOWN ORIGIN; TICS

Tic convulsif is a very chronic disorder characterized by quick, electric-like spasms of groups of muscles or single muscles. There is a period of rest between the violent spasms. We see it limited to special nerves, especially the facial (mimic tic), or to branches of nerves, as in the orbicularis, zygomaticus, diaphragm, or tensor tympani. Sometimes the spasms are accompanied with bursts of speech, as when the patient uses obscene language (tic impulsiv, coprolalia) or involuntarily repeats the last words of a sentence (echolalia) or spasmodically imitates a gesture (echokinesis) or involuntarily speaks out a thought, sometimes against his will (tic de pensée).

The disease begins with these violent movements, which can be controlled for a time. They cease during sleep. The disease may last for years, and is best treated by isolation, when children are afflicted, by tonics, and ordinary antispasmodics, also by vibratory massage.

Tic coördiné (**habit chorea, habit spasm**), which sometimes represents aborted chorea, is a peculiar trick of speech, gesture, grimace, shrug of the shoulder, twitching of the eye, or sniff, with which a person may go through life. When it is seen in children, the treatment is moral, hygienic, and medicinal. *Head nodding* is a form of habit spasm (see Pædiatrics).

Stammering is an improperly regulated motor impulse from the cortex of the brain.

OCCUPATION NEUROSES

Occupation neuroses are functional nervous disorders characterized by spasmodic, tremulous, incoordinate, or paralytic disturbances with the feeling of fatigue or pain upon attempting to perform the customary function the overperformance of which has brought it about.

Writer's cramp is a typical form. Among the predisposing causes are heredity and a neuropathic constitution. Excessive worry, intemperance, and all debilitating influences are also predisposing. The exciting cause is excessive writing, but essential to its causation is a cramped position, in which the fingers alone are used, and the little finger or wrist is resting over the table. Free hand writing, with motions by the whole arm from the shoulder, is least harmful. Lead poisoning, exposure to wet and cold, and local injuries are sometimes exciting causes.

SYMPTOMS.—It develops slowly with stiffness in the fingers and uncertain, jerky movements. There is fatigue and sometimes actual pain. Later, as soon as writing is attempted, the pen is likely to fly in all directions, and there is no coordination of movement.

We may speak of four forms or degrees in order of frequency or progression, but they are usually more or less mixed.

1. The spastic form, the most common, is that in which there is a cramp, a tonic spasm of the muscles (sometimes the flexors and sometimes the extensors), usually those of the thumb and the first three fingers. The pronators and supinators may be affected. Then the thumb and first finger may alone be involved. There is also incoordination.

2. The neuralgic form is that in which, in addition to the spasm, there are fatigue, pain, and sometimes tenderness along the arm.

3. The tremulous form is rather rare. Upon attempting to write, there is a tremor of the fingers holding the pen, which may involve the forearm or even the whole extremity. It is an intention tremor.

4. The paralytic form, more rare, is that in which the fingers seem powerless to hold the pen. Persistence and will power will cause pain and weakness, so that writing becomes impossible.

There are other symptoms, mainly psychical, sensory, and rarely vasomotor and trophic. Mental depression, emotional disturbances, insomnia, vertigo, pain, fatigue, numbness, prickling, pressure, weight, tension, constriction, etc., may be present. There may be local swelling and a sensation of throbbing. Local sweating, dryness of the skin, and cracking of the nails may result.

The *electrical reactions are not uniform.* The electrical examination may show the stage of the disease, as neuritis is undoubtedly present in some forms.

The PROGNOSIS is unfavorable, but cases of complete recovery are occasionally seen and temporary improvement is frequently observed.

Other Forms of Cramp.—*Musicians' Cramp.—Pianists', violinists', flutists'*, and *clarionetists' cramps* are very similar, with atrophy of certain muscles. *Telegraphers' cramp,* in which the extensors of the wrists and fingers are most affected, is rather common. *Sewing spasm,* in tailors, seamstresses, and shoemakers, is occasionally seen. The muscles of the hands are seized with clonic and tonic spasms upon attempting to use them. *Drivers' spasm, cigarmakers' cramp, milkers' spasm, watchmakers' cramp,* and *photographers' cramp* are rare. *Ballet dancers' cramp* is probably a neuralgic affection. Artificial flower makers, billiard players, dentists, hide dressers, electrical instrument makers, stampers, turners, sewing machine operators, money counters, weavers, painters, and pedestrians also may have occupation neuroses.

Sacral nerve twitchings, tremor rigidity, clonic and tonic spasms, myoclonus, and athetoid movements are seen as a part of some general or central disorder or as occupation neuroses. *Saltatory* spasm involves the legs alone.

Chorea is described under the section on Pædiatrics.

Treatment of Tics.—Prophylaxis in writers' cramp. One should use a gold pen, smooth paper, and large cork or rubber penholders, making the motions from the shoulder, having the paper on the desk at an oblique angle to the edge of the desk, and far enough away from the edge so that the elbow can rest on the desk.

When the cramp has developed, rest is the most important aim. The patient should use the other hand or another holder; use other fingers, one of the appliances purposely arranged, or the typewriting machine. Massage, electricity, and exercises have cured some cases. In the other neuroses we should secure rest by using the other hand or other muscles and by general treatment as above mentioned.

TETANY; PSEUDOTETANUS

This is a subacute or chronic spasmodic disorder characterized by intermittent or persistent tonic contractions, associated with paræsthesia and overexcitability of the motor and sensory nerves.

Ætiology.—It is rare in this country. It occurs in infancy and childhood, at puberty, and occasionally afterward up to fifty years. It occurs more often among males, and among the poorer classes. The exciting causes are exhausting influences, such as diarrhœa, lactation, sepsis, fatigue, mental shock, and fevers. Alcoholism, dilatation of the stomach, and intestinal parasites are causes. Extirpation of the thyreoid gland may be a cause.

Symptoms.—Paroxysms of bilateral tonic spasm begin in the muscles of the hands, or of the hands and feet, after prodromal tingling and stiffness, and the spasm extends toward the trunk, which is involved in severe cases. The hands assume the obstetric position, the wrists and elbows slightly flexed, arms adducted, toes flexed, feet in the equino varus position, knees and hips extended or rarely flexed, and thighs adducted. The jaw is not affected until late, if at all. In the intervals, spasm may be excited by pressure on nerve trunks or arteries (Trousseau's symptoms). The galvanic, faradic, and mechanical irritability of the affected muscles is enormously increased.

Treatment.—Remove the cause if possible. Prescribe rest, nourishing food, and tonics. Symptomatically, give bromide of potassium, ʒjss. to ʒij daily, with chloral. Chloroform and morphine may be necessary. Lukewarm baths may be of service, also ice bags to the spine. Only weak galvanic currents should be used if electricity is tried at all.

PARALYSIS AGITANS (SHAKING PALSY; PARKINSON'S DISEASE)

This is a chronic progressive disorder with tremor, muscular rigidity, and weakness, and with a peculiar gait and attitude. There are also sensations of heat, pain, and restlessness.

Ætiology.—It is oftenest seen between fifty and sixty years of age. Exposure, hard labor, rheumatism, and rheumatoid arthritis seem to be predisposing causes. The exciting causes are fright, injury, and prolonged mental anxiety. Sciatica or rheumatism, sudden severe muscular strain, and fevers are rare causes.

Symptoms.—The tremor begins after forty years of age, usually in one hand, rarely in one leg, and slowly extends to the other limb on the same side and then to the limbs on the other side. As a rule it may be lessened or stopped by effort, but continues during rest. Rarely, in an early stage, it is elicited by effort. Following the tremor, beginning in the same part and spreading in the same order, muscular weakness and rigidity appear, the muscles, especially the flexors, gradually contracting so as to cause a characteristic posture with absence of facial expression. The hands assume the "pill rolling" position. There is a slight flexion of the knees, hips, wrists, elbows, and shoulders. The extensors may be involved. The head and spine are bent forward and the face stares straight ahead. The patients are restless, uncomfortable, and unhappy and often have sensations of heat and cold. The tendon reflexes are generally normal, rarely exaggerated. Nystagmus is not present. The speech becomes affected early. The voice becomes senile, high pitched and weak, and there is a slowness in starting to talk. A patient afflicted with paralysis agitans who is propelled forward or backward cannot stop at will. The rigidity increases, as does the tremor, and finally the patient becomes bedridden and dies of some intercurrent disease. The course averages from three to twelve years.

Differential Diagnosis.—We have to distinguish this disease from senile tremor, multiple sclerosis, and posthemiplegic tremor. In senile tremor, the tremor is an intention tremor. The head is first affected. In multiple sclerosis the tremor is more jerky, and there are nystagmus, syllabic speech, eye troubles, paralyses, and often apoplectoid attacks. Posthemiplegic tremor has the history of hemiplegia; the disease is unilateral and there are paralyses and exaggerated reflexes. Alcoholic and hysterical tremors may be mistaken for paralysis agitans.

The **prognosis** as to life is good, but bad as to a cure. Sometimes we may stop the increase in the symptoms.

The *pathological* changes are not known.

Treatment.—Physical and mental rest and fresh air should be advised, also lukewarm baths and mild massage. The galvanic current, daily employed, gives temporary relief. Psychical treatment benefits some cases. For drugs, tonics of all kinds are used, and for antispasmodics, hyoscine hydrobromide, codeine, and morphine are used.

OBSTINATE HICCOUGH

Hiccough is looked upon as a reflex spasm of the diaphragm with simultaneous closure of the glottis, the pneumogastric being the centripetal and the phrenic and recurrent laryngeal the centrifugal nerves involved. When associated with grave organic lesions, it may be of an obstinate type, but generally subsides on the application of one or more of the following procedures if it is due to hysteria or gastrointestinal disorders: 1. Holding the breath for 15 or more seconds. 2. Hot applications over the cervical spine and diaphragmatic area. 3. Firm pressure upon the phrenic nerve over the scalenus anticus muscle. 4. Rapid swallowing of small pieces of ice. 5. The use of such antispasmodic drugs as morphine or chloroform. 6. Traction on the tongue, intermittently applied, as in chloroform poisoning. 7. Galvanization of the phrenic nerve. 8. Faradization of the epigastric region (Erb). 9. Forcible elevation of the hyoid bone by the attendant's fingers (Nothnagel). 10. Taking snuff. 11. Applying a bandage tightly around the body. 12. Hypodermic injections of hydrochloride of pilocarpine. 13. Lavage of the stomach.

DISTURBANCES WITH LOSS OF THE POWER OF MOTION PREDOMINATING (PALSIES, ACUTE AND CHRONIC)

CEREBRAL APOPLEXY (HÆMORRHAGE, EMBOLISM, AND THROMBOSIS)

Cerebral apoplexy, to use the term in the restricted sense, is a sudden paralysis, usually with loss of consciousness, and is due to a rupture or occlusion of a blood vessel in the brain. We recognize two forms, *intracranial hæmorrhage*, from rupture of a vessel, and *acute softening*, from thrombosis or embolism.

Pathology.—The usual condition leading to apoplexy is chronic endarteritis. This disease of the walls of the arteries tends to the obliteration of the lumen of the vessel, to fibrin deposits on the roughened wall producing *thrombosis*, to embolism in consequence of this deposit being washed onward, and to erosions and ruptures producing hæmorrhage. The kind of paralysis varies with the part of the brain in which this lesion takes place.

Ætiology.—The age of liability to hæmorrhage is between forty-five and sixty-five. Males are more liable to hæmorrhage than females. The predisposing causes of endarteritis are gout, alcoholism, and syphilis, and nephritis, endocarditis, and emphysema are often associated. As an exciting cause of hæmorrhage we may include anything which increases the heart's action (heart strain), such as fright, anger, exertion, or a cold bath. Anything weakening the action of the heart may cause thrombosis.

Symptoms.—Premonitory queer, dull, heavy feelings in the head, vertigo, insomnia, headache, inattention, imperfect memory, and temporary attacks of numbness in half of the body may occur for months before the onset. If we can rule out *digestive disturbances*, which produce practically the same symptoms, and kidney lesions, etc., we should look after the circulation, examine the arteries, and guard against the attack by advising avoidance of the exciting causes.

The attack comes on suddenly, with unconsciousness usually, although in very light types there may be no unconsciousness or it may be slight. It is usual for paralysis of one half of the body (hemiplegia) to occur with coma and convulsions. The face is red; the pulse slow, full, and of high tension; the respirations deep and stertorous. The temperature may be subnormal or normal, but after some hours it may reach from 102° to 104°. The head may deviate to the side of the lesion. The pupils vary, but usually there is dilatation on the side of the lesion. There may be *hemiplegia*, *hemianæsthesia*, and *hemianopsia* at first. The reflexes are at first inhibited, to become permanently exaggerated later. There is rigidity of limbs when the hæmorrhage is large, and convulsions are observed when it is on the cortex. The urine and fæces may be passed involuntarily, or the urine may be retained and may contain albumin and sugar. Death may occur in one or two days, in coma with high temperature. Usually there is slow recovery of consciousness; the paralysis gradually improves for a year and then remains stationary.

The symptoms, after a week, indicate the situation of the lesion, and those remaining at the end of a month indicate its extent. If contractures in the paralyzed limbs develop, they indicate descending degeneration in the motor tract. With the *hemiplegia* we observe flatness of the face on the paralyzed side; the muscles slightly draw it from this side; the eye can be closed and moved; the tongue deviates toward the paralyzed side; the finer motions of the hand and arm are more permanently affected than the elbow or shoulder motions; the upper extremity is carried in a flexed position; the leg is stiff and extended and does not bend easily at the knee, and the foot is dragged on its inner edge and swung around in walking. The trunk and respiratory muscles are very rarely affected. The control of the bladder and rectum may not be complete. Hemianæsthesia and hemianopsia may remain without hemiplegia. The contractures developing may cause pain. Aphasia of some kind may accompany a right sided hemiplegia, or it may occur alone.

Mental affections sometimes appear and may remain as the only permanent symptoms. The patient may not be able to control his emotions, so that he laughs or cries upon slight cause, shows irritability of temper, lack of judgment, imperfect memory of recent events, imperfect concentration of the mind, general bewilderment, not recognizing his surroundings or friends, mild delirium or delusions, or even dementia. These usually pass away. Epileptoid attacks may develop and recur at long intervals after an attack of apoplexy.

Diagnosis.—Hæmorrhage occurs after the age of fifty-five, as a rule, with atheromatous arteries and an hypertrophied heart. The onset is sudden, with coma, during exertion or excitement. The temperature falls in an hour, and then rises, sometimes to 106°. Gradual recovery of consciousness takes place in from three to five days, with permanent hemiplegia.

Cerebral embolism comes on at any age, with heart disease or after childbirth. There is a sudden onset, without loss of consciousness or with slight mental confusion or with rapid return to consciousness. The temperature does not fall, but may rise as high as 102°. Improvement occurs within twenty-four hours to a marked degree, but after three or four days the symptoms return. Monoplegia, hemiplegia, or aphasia may remain. Jacksonian epilepsy may develop if the lesion is cortical, involving a special centre.

Cerebral thrombosis occurs at any age, but chiefly in syphilitic persons and middle aged men. There are usually premonitions. The onset is slower, without coma, but with dulness of the mind. The temperature does not fall, but may rise to 100°. The paralysis is similar to that observed in embolism.

The **diagnosis** between these three conditions is hardly ever positive. The **prognosis** depends upon the depth and duration of the coma, on the condition of the pulse and respiration, on the constitution and age of the patient, and on the number of previous attacks.

Treatment.—In the stage of apoplexy we should employ rest, quiet, and an ice bag to the head; venesection in plethoric cases; and purgatives of a drastic nature. Stimulants should not be given unless the heart fails.

Care in feeding is necessary, on account of possible inability to swallow. The catheter should be used in urinary retention. Later, for the paralysis, we may try exercise, massage, vibration, and faradism to the muscles and iodide of potassium internally.

BULBAR PARALYSIS (GLOSSOLABIOLARYNGEAL PARALYSIS)

This is a rare disease characterized by a slowly progressing paralysis with atrophy in the motor cranial nerve nuclei. There is an acute form, differing only from the chronic by the suddenness of the onset.

Ætiology.—There are small hæmorrhages into the medulla in acute bulbar paralysis, and areas of softening following embolism or thrombosis. It is an acute inflammatory affection analogous to anterior poliomyelitis, or it may be due to a terminal lesion of Landry's paralysis. It is almost regularly bilateral.

Symptoms.—There is disturbance of the speech—alalia (impaired articulation of the labial letters r, l, d, and t); atrophy and tremor of the tongue occur, with paralysis; and chewing and swallowing are impaired. The muscles of lips and face become weak and thin, and we observe impairment in pronunciation of the labial letters p, b, v, and f, also atrophy and tremor of the lips with paralysis. Whistling is impossible and the facial expression is impaired. The saliva is increased and runs from the mouth. The action of the muscles of the pharynx and larynx is impaired; food regurgitates or cannot be swallowed; the reflex action is impaired and the larynx is therefore unprotected; the voice is low and monotonous; and it is impossible to cough. There is no change in the sensation of taste. The pulse is sometimes rapid, 100 to 130. The duration is from two to five years.

The **differential diagnosis** should be made from pseudobulbar paralysis of cerebral origin, where the lesion is in the lower portion of the third frontal convolution, and is not followed by atrophy. In *myasthenia gravis* no pathological changes have been found. Death occurs from inanition, aspiration pneumonia, or heart failure.

Treatment.—When deglutition becomes impaired, we may feed the patient with the stomach tube. We may give large doses of strychnine early in the disease.

OPHTHALMOPLEGIA

Progressive ophthalmoplegia is a rare disease due to progressive atrophy of the nuclei of the motor nerves of the eye. According to which muscles are involved, there may be ophthalmoplegia externa or interna. **Ophthalmoplegia externa** is the more common. There is a gradually increasing loss of power in all the muscles of the eyeball. We therefore observe ptosis, strabismus, nystagmus, immobility of the eyeball, and double vision. **Ophthalmoplegia interna,** exceedingly rare, causes loss of the reflex to light, and is a symptom in locomotor ataxia and general paresis.

The DIAGNOSIS should be made from paralyses of the single nerves (the third or the sixth nerve) by the facts that such a paralysis is unilateral and that only the muscles supplied by that nerve are affected.

TREATMENT.—If vibratory massage and iodide of potassium fail to improve matters, the case is hopeless.

Pressure palsies of cerebral origin, from the *pressure of inflammatory* products, such as tumors and abscesses, include acute pachymeningitis externa, acute pachymeningitis interna, chronic pachymeningitis interna, acute meningitis, chronic meningitis, and meningeal hæmorrhage, which are described under the separate headings: Meningitis, Tumors, Abscess, and Brain Syphilis. For infantile cerebral paralysis and obstetrical paralysis see the section on Pædiatrics.

SPINAL APOPLEXY

(Hæmorrhage into the Spinal Cord—Hæmatomyelia, Intramedullary Hæmorrhage) has been observed in tetanus, strychnine poisoning, and conditions leading to sudden asphyxia. It may complicate inflammation and tumors. It may be due to blows, falls, convulsions, or the hæmorrhagic diathesis.

Pathology.—The hæmorrhage is usually situated in the central gray matter, and if large enough will be destructive in character.

The **symptoms** are irritative and paralytic.

The **prognosis** is not so good in intramedullary as in extramedullary hæmorrhage.

The **treatment** is symptomatic, in the hope that absorption may take place.

ANTERIOR POLIOMYELITIS

Anterior poliomyelitis in adults occurs more often in men than in women. The ætiology and pathology are the same as in children (see Pædiatrics), except that the onset is less acute; the cranial nerves may be involved in some cases; rheumatoid pains may be present and are referred to the affected muscles and joints; muscular tenderness may be extreme; fewer muscles are affected and recovery is more complete; withering and retarded growth are not so noticeable. The treatment is symptomatic.

Subacute Chronic Anterior Poliomyelitis.—ÆTIOLOGY.—The causes are falls and other injuries, alcoholic and sexual excesses, syphilis, and lead poisoning.

SYMPTOMS.—The onset is gradual, with motor weakness increasing to paralysis. The paralysis begins in the hand and spreads downward and upward. The paralyzed muscles undergo atrophy, and there is absence of the reflexes, with the reaction of degeneration. There is no sensory involvement, and the bladder and rectum are not involved.

PROGNOSIS.—Recovery is very rare. Usually there is a certain degree of improvement in a few weeks or months. Death may result from an extension of the disease to the medulla.

The TREATMENT is symptomatic.

Anterior poliomyelitis in children (atrophic spinal paralysis) is described in the section on Pædiatrics.

SPINAL PROGRESSIVE MUSCULAR ATROPHY; WASTING PALSY (ARAN: DUCHENNE TYPE)

The disease is most frequent in males between twenty-five and forty-five years old. An hereditary factor may rarely be present. Traumatism, acute infectious diseases, especially typhoid, measles, cholera, and acute rheumatism, syphilis, and, more than anything else, lead poisoning, are the causes. Puerperal infection may be an ætiological factor.

Pathology.—The primary lesion is in the anterior horns of the spinal cord.

Symptoms.—The disease begins gradually and insidiously in the fingers and interossei muscles and travels upward and downward. There are slight rheumatoid pains in the shoulder or arm. The muscles tire easily and become less firm. Muscular atrophy usually appears first in one hand, in the interossei and the ball of the thumb. The atrophy spreads from muscle to muscle. Motor weakness is proportionate to the atrophy, and there is no essential paralysis. The hand assumes the characteristic appearance, "main en griffe." In a few cases the deltoid is affected first, and the atrophy descends, constituting the "upper arm" type. In from three to nine months the other arm begins to be affected. In rare cases the atrophy may begin in the lumbar or abdominal muscles of the legs, and ascend (perineal type).

The atrophied muscles are flaccid and usually retain their normal electrical reactions (differential factor between chronic anterior poliomyelitis and amyotrophic lateral sclerosis, in which there is a spastic condition with rigid muscles). The reflexes are diminished according to the amount of atrophy. Fibrillary twitchings occur. When the lumbar muscles are implicated, the back is arched and the line of gravity falls behind the sacrum. When the abdominal muscles are affected, the back is arched, but the line of gravity falls in front of the sacrum. In time, all the voluntary muscles may be involved. The face muscles are normal, but the body is greatly wasted. Ophthalmoplegia externa and bulbar paralysis may develop toward the close of the disease.

Prognosis.—The course is usually progressive. Death may come from exhaustion, bulbar paralysis, or respiratory affections. The patient may live for years, the disease becoming quiescent.

The **treatment** does no permanent good and is symptomatic only. Iodide of potassium is indicated.

PROGRESSIVE HEREDITARY MUSCULAR ATROPHY, PERINEAL (CHARCOT-MARIE) TYPE

This is an hereditary, or family, muscular atrophy beginning in the legs and extending upward. It is not known whether it is central or peripheral in origin. Almost always it begins before the age of twenty, and affects males oftener than females. First the muscles of the leg, then the extensors of the toes, and then the calf muscles are affected. Later the thigh muscles, and after some years the muscles of the forearm and hand are reached. The shoulder, arm, neck, and trunk muscles escape. Fibrillary contractions are occasionally present, and there is always a partial or complete reaction of degeneration. The disease continues for years, with remissions, and although it is not curable, the prognosis is better than in the arm type.

The **treatment** is the same as that in other forms of hereditary muscular atrophy.

AMYOTROPHIC LATERAL SCLEROSIS

This is really a form of progressive muscular atrophy, with the same ætiology, differing by showing spastic symptoms and paralysis.

The **symptoms** result from a combination of progressive muscular atrophy and lateral sclerosis. Wasting, weakness, rigidity, contractures, and exaggerated reflexes develop. Atrophy and weakness are especially marked in the arms and hands, while in the legs the spastic paraplegia develops early. Muscular fibrillary twitchings are usual. The bladder and rectum are controlled, and there are no sensory symptoms. Rigidity and muscular wasting become general, and paralysis results. Symptoms of bulbar paralysis and ophthalmoplegia externa make their appearance.

The **prognosis** is not so good as in progressive muscular atrophy. The disease is seldom if ever arrested, and death results in from one to four years.

Treatment gives no satisfactory results.

LATERAL SCLEROSIS

Lateral sclerosis (spastic spinal paralysis) is a chronic sclerotic process affecting the lateral pyramidal columns of the spinal cord. If it is a primary disease, which is exceedingly rare, it is bilateral.

Differential Diagnosis from Anterior Poliomyelitis (Starr)

Lateral Sclerosi	*Anterior Poliomyelitis*
1. Lesion in pyramidal tracts.	1. In anterior gray horns.
2. Paralysis usually on both sides equally, in legs or in legs and arms, never in arms alone.	2. Paralysis may be limited to any single limb, rarely affects both limbs equally.
3. All muscles are about equally affected. No muscles entirely normal.	3. Certain groups only of muscles are affected. Others escape wholly.
4. Muscular tone heightened.	4. Diminished.
5. Tendency to rigidity.	5. Relaxation.
6. Reflex excitability increased.	6. Lost.
7. Atrophy absent or slight; merely due to disease, gradual in progress, affects entire limb.	7. Always present in paralyzed muscles; advances rapidly; may become extreme.
8. Electric contractility unchanged.	8. R. D. present within two weeks of onset.
9. Vascular tone diminished; cyanosis and œdema may occur.	9. Vascular tone diminished, but œdema not present.
10. Paralyzed limb is cold; sweat may be increased.	10. Paralyzed limb cool; sweat not increased.
11. Trophic disturbances of skin are not infrequent.	11. Not present.
12. Control over bladder and rectum impaired or lost.	12. Not impaired.

Secondary lateral sclerosis is the most frequent form of spastic paraplegia, and results from any lesion in which the central motor neurone is involved. These lesions may be: Tumors, softening, or hæmorrhage in the brain; congenital maldevelopment of the brain and hydrocephalus; or a cord lesion, unilateral or bilateral, or compression of the cord by disease of the vertebræ or myelitis and meningomyelitis.

Symptoms.—Idiopathic spastic paraplegia shows a weakness and stiffness in motion, beginning in the legs and ascending, and finally involving the arms. Atrophy is not present. Reflex and mechanical excitability is increased, causing increased knee jerk and the presence of ankle clonus. There is rigidity from increased spinal activity, making the gait characteristic. This is at first spastic; the toes drag, the knees overlap, motion is stiff, and finally, in complete paralysis, the legs are drawn up, the knees overlap, and are so rigid that the patient cannot move them. The muscles show no degeneration reaction.

There is, late in the disease, impairment in the control of the bladder, which finally results in paralysis with involuntary emptying or with retention. Constipation is obstinate. The bladder and rectum are not affected in some cases of primary sclerosis. No sensory symptoms are present. Nutrition is impaired and the vascular tone is diminished toward the end of the disease, causing blueness and coldness. Death is rare from this disease by itself. The symptoms develop slowly and increase until, after many years, permanent paralysis develops.

LOCOMOTOR ATAXIA (TABES DORSALIS; POSTERIOR SPINAL SCLEROSIS)

Ætiology.—Males are affected with this disease about ten times as often as females. It is most common between the ages of thirty and fifty. Syphilis precedes the disease in over 90 per cent of the cases.

Pathology.—Briefly, it may be stated that there is a degeneration of the posterior roots of the dorsal columns of the cord. Sometimes the spinal ganglia and peripheral nerves are affected.

The **symptoms** are usually divided into four stages: the stage of pain, loss of tendon reflex, the stage of ataxia, and the stage of paralysis.

Stage of Pain and Loss of Tendon Reflex.—Pain occurs in 90 per cent of the cases. It is of a paroxysmal, darting character, bilateral, extending down the legs, and generally referred to the deeper structures. The pains are lightninglike in character, irregular in distribution, seldom or never corresponding to nerve trunks, and there is no local tenderness. Sometimes the pain is diffused and superficial, and the patient may have a sensation of extreme heat or cold. When the lesion extends to the cervical region of the cord, there may be lightning pains in the arms. In a few cases where optic atrophy is one of the first symptoms the pain may be absent or slight. In these cases the ataxia is not apt to develop. Occasionally there are trophic disturbances.

Paræsthesiæ.—In this pain stage there are sensations of numbness, formication, dead extremities, cotton or pins in the soles of the feet and the fingers, coldness, and itching of the anus, scrotum, and other parts. There is a sensation of tightness or pressure around the waist, the girdle sensation, which ascends gradually as the disease advances.

Westphal's symptom, loss of the knee jerk, is one of the earliest symptoms and one which is seldom absent. If it is associated with lightning pains and the ocular symptoms, we have a symptom group absolutely diagnostic of locomotor ataxia.

Bladder and Rectum Symptoms.—There is imperfect control of the bladder. There is slow urination, with slight dribbling, or hasty urination may be seen. Later, the control is very imperfect and micturition may be very painful. Cystitis may occur and it may be a serious symptom, as it sometimes results fatally. Impotence is usual, but previously there may be priapism and disordered sexual excitement. Constipation is usually obstinate.

Eye Symptoms.—There may be ptosis, strabismus, double vision, or in rare cases ophthalmoplegia externa. The *Argyll Robertson pupil*, a symptom present in this stage in 80 per cent of the cases, is the loss of the pupillary reflex to light, the reaction in accommodation being preserved. *Contracted pupil*, "*meiosis spinalis*," is frequent but not constant.

STAGE OF ATAXIA, ANÆSTHESIA, AND ANALGESIA.—The sense of pain is impaired and delayed, which prevents the knowledge of injuries received, so that such symptoms as *ulcer of the foot* and *Charcot's joints* occur as complications. We should guard against accidents and neglect of injuries, as in giving hot baths, etc.

HYPERALGESIA.—The sensation of pain may be severe simply from a touch. There is a change in the sensation of temperature, cold being felt keenly and heat less than normal. Late in the disease, there is a development of complete anæsthesia in the extremities.

IMPAIRMENT OF MUSCULAR SENSE.—The situation of the limbs is imperfectly perceived, so that, as it is normally a means of perfect guidance, its absence causes the patient to walk badly in the dark, to be unable to touch objects accurately with the eyes closed, and to watch his own motions, aiding his muscular sense by sight. A blind ataxic is a most helpless person. *Ataxia*, or imperfect coordination of muscular action, is a prominent symptom. The ataxic gait is that in which the legs are held too far apart, the feet are lifted too high and put down too forcibly, the steps are of irregular length, and the body is imperfectly balanced. The hands cannot be perfectly controlled, as in writing, dressing, and the finer movements. There is an irregular contraction of the muscles and there is imperfect tone in them. To test the ataxia, we ask the patient to stand with his eyes closed and walk, turn suddenly or walk backward, to touch the heel to the toe or the heel to the knee, to touch the finger to the nose, to pick up a pin, etc.

SYMPTOMS OCCASIONALLY PRESENT are those due to neuritis of different nerves. Progressive blindness due to atrophy of the optic nerve is present in about 20 per cent of the cases. Paralysis of the third cranial nerve causes divergent strabismus, with dilated pupils and ptosis. Nystagmus rarely occurs. Paralysis of the sixth nerve causes convergent strabismus with contracted pupils. Atrophy of the auditory nerve gives rise to deafness.

CRISES.—1. *Gastric crises*, sudden vomiting with pain, may occur at intervals lasting from several hours to several days. It is followed by great prostration, and may make nutrient enemata necessary. Intestinal and rectal crises with diarrhœa and tenesmus are rarely seen.

2. *Laryngeal Crises.*—Sudden severe cough with spasm of the larynx and suffocation.

3. *Cardiac Crises.*—Attacks of angina pectoris are rare. These symptoms are all due to a complicating neuritis of the pneumogastric nerve, and are not very common. In this stage, trophic disturbances are more common.

CHARCOT JOINTS at the knee, elbow, ankle, and wrist. There are swelling and effusion without pain. There may be erosion of the ends of the bones and destruction of the articulation. Injury precedes these joint lesions (see section on Joint Diseases). *Perforating ulcer of the foot* may develop from neglect of a corn, a subcutaneous hæmorrhage, or caries of bone. Rarefaction of bones, with spontaneous fractures, may occur. Irregular muscular atrophies may develop late in the disease. Herpetic eruptions and pemphigus may occur. These symptoms are largely due to a loss of the sensation of pain, which prevents knowledge of injuries, or to a peripheral neuritis.

STAGE OF PARALYSIS.—Although the general nutrition remains good, the ataxia becomes so bad as to make the patient helpless, and he is obliged to keep to his bed. The control of the rectum and bladder is lost, the urine dribbling constantly. The trophic disturbances are more marked, and also injuries from accidents. Patients die from exhaustion, or complicating pneumonia. Fatal asphyxia may result from a laryngeal crisis or aspiration pneumonia due to anæsthesia of the larynx.

Prognosis.—The disease is chronic and lasts from twenty to forty years. Ataxia is rarely developed until from five to eight years after the beginning of the disease. Recovery never occurs, but arrest of the disease may take place at any time, particularly during the first stage.

MODES OF ONSET.—The most usual beginning is with pain, loss of knee jerk, bladder trouble, impotence, and ataxia. Occasionally it may begin with blindness, loss of the knee jerk, imperfect gait, and numbness, but no pain; or with gastric crises, at intervals, loss of the knee jerk, and then pain and ataxia; or with various forms of strabismus, meiosis, and then ataxia of the arms.

The **diagnosis** is made early by means of the pains, fatigue, loss of the knee jerk, and the Argyll Robertson pupil. Later we make it from the presence of ataxia and bladder trouble. Multiple neuritis is sometimes confounded with tabes, but its onset is rapid, paralysis occurs early, control of the bladder is present, and there is no Argyll Robertson pupil.

Treatment.—There should be ordered moderate exercise, but avoidance of all fatigue. The diet should be full and good. Douches over the spine of tepid or cool water (never at extremes of temperature) are helpful. The patient should have massage and try to overcome the ataxia by practising fine movements. An inunction course or mercury and potassium iodide may be tried. The pain may be treated with the coal tar products, gelsemium, opium, faradization, and hot applications; the crises with counterirritation and morphine. Care should be observed not to injure the patient by counterirritation or hot applications, as trophic disturbances are likely to follow. Optic nerve atrophy should be treated with strychnine. The trophic disturbances are best met with rest and apparatus.

Hereditary Ataxia (Friedreich's Ataxia)

Although this is not necessarily an hereditary disease, it is really a family disease, as several brothers and sisters may be affected. When it is hereditary, there is usually a family history of some nervous disorder—insanity, inebriety, or nervous irritability. It is apt to appear between the fifth and fifteenth years.

Pathology.—There is sclerosis of the posterior and lateral columns of the spinal cord, which may extend upward.

Symptoms.—The ataxia begins in the legs, but it is different from that of locomotor ataxia, for the gait is more swaying and irregular and there is less stamping. Romberg's symptom is sometimes present. The deep reflexes are lost early. Later, ataxia develops in the arms, causing choreiform movements, which may be observed during rest. Nystagmus and a slow, scanning speech are commonly observed. Optic atrophy and visceral symptoms are uncommon. Trophic changes are not observed. There is a fairly characteristic deformity of the foot. The patient walks on the outer edge of the foot, with the big toe flexed dorsally upon the first phalanx. Talipes equinus develops. There are no sensory symptoms. Late in the disease the mind becomes impaired, and paralysis appears, which may become complete. The affection is incurable and extends over many years. Care should be taken to prevent contractures. There is no effective treatment.

ATAXIC PARAPLEGIA (COMBINED SCLEROSIS)

This is a disease developing in males of middle age and characterized by a combination of ataxia and paraplegia. There may be a history of infection or of sexual excesses, but a history of syphilis is seldom to be obtained.

Pathology.—There is a combined sclerosis of the posterior and lateral columns of the cord, beginning in the lumbar region. The nerve roots are not involved, as in locomotor ataxia.

Symptoms.—Slowly developing weakness of the legs occurs, with rigidity and ataxia. The knee jerk is exaggerated, and the ankle clonus can be elicited. Romberg's symptom is generally well marked, developing later, but eye symptoms are rare. For sensory symptoms we observe usually only a dull aching pain in the sacral region, etc. The ataxia and weakness may extend to the arms. Finally paralysis and failure to control the sphincters develop. Mental symptoms, similar to those in general paresis, may develop.

Diagnosis.—From the combination of marked incoordination with more or less spasm and presence of the reflexes, the diagnosis is easy. The absence of ocular and sensory symptoms is an important point. It is, in short, a motor weakness, with symptoms of tabes.

Prognosis.—The disease is incurable. Death results from complications. The **treatment** is symptomatic.

MYELITIS

Myelitis is a disseminated inflammation, or it may involve an entire segment of the cord, both gray and white matter.

Pathology.—The cord has a normal appearance, but is soft at points. It may be soft enough to be fluid. The gray matter looks red, and capillary hæmorrhages are seen. There are marked microscopical changes.

Ætiology.—Infection, injury, disease of the vertebræ, or tumors, causing compression or destruction of the cord, are among the causes. It may result from acute infectious diseases, especially smallpox, measles, and typhus fever. It may follow the primary lesion of syphilis within a year or eighteen months, and the growth of gummata may be the cause of compression. Chronic alcoholism is mentioned as a cause. Males are more often affected than females, particularly soldiers and porters.

Varieties.—We speak of *acute, subacute,* and *chronic cases.* Also, according to the amount of cord tissue diseased and the situation, we speak of *general myelitis,* where the entire cord is affected, ascending or descending; *disseminated myelitis,* where various segments at different levels are affected; and *transverse myelitis,* where one or two segments at one level are affected.

Symptoms.—Direct symptoms result from destruction of tissue in the cord. According to the situation of the lesion in the cord do we observe the distribution of direct symptoms. General myelitis gives rise to universal symptoms, disseminated myelitis causes scattered symptoms, and transverse myelitis limits them to one level. The *motor symptoms* are paralysis, atrophy, loss of muscular tone, and the reaction of degeneration. The *reflex symptoms,* according to the situation of the lesion, are paralysis of the bladder and rectum, and impotence. The *sensory symptoms* are numbness, anæsthesia, paræsthesia, hyperæsthesia, and pain. The back is tender to heat sensations. The *vasomotor* and *trophic symptoms* are bedsores, profuse sweating, and imperfect circulation with coldness of the skin. A knowledge of the spinal nerves and their distribution is necessary to ascertain the level of the disease in the cord.

Indirect symptoms are due to the interruption of the impulses normally passing through the cord. Below the lesion there is paralysis, with increased reflexes, muscular rigidity, and contractures. The paralyzed muscles do not undergo atrophy. There is no reaction of degeneration. The bladder is usually not paralyzed, but there is loss of control, with priapism. Although there is imperfect sensation, coordination remains intact. The anæsthesia permits of the formation of bedsores over the sacrum, glutæi, heels, and ankles. There is moderate fever.

Course.—General myelitis and disseminated myelitis may be acute or subacute in their onset. The disease begins with weakness of the limbs, pains in the back and limbs, and prostration, and then there follow paralysis, pain and anæsthesia, and bladder and rectal symptoms, with confinement in bed and the development of bedsores. The course is slow, from one to three years. Occasionally there is a slow imperfect recovery. Usually death takes place from cystitis, or pneumonia. *Transverse myelitis,* when acute, may rarely develop in two days. It comes after an injury, blow, fall, wounds, dislocation of the spine, or a strain, which cause a hæmorrhage in the cord. It may arise from an embolus of a spinal artery. Its *course* is chronic after spinal caries with deformity and pressure, or after a tumor in the spinal cord or canal. The length of its course depends upon the possibility of removing the cause.

The **diagnosis** of myelitis is rarely difficult. Landry's paralysis and some cases of multiple neuritis and meningitis show similarities. Landry's paralysis shows very slight sensory disturbances, no trophic symptoms, very seldom bladder and rectum paralyses, and no electrical changes.

In *multiple neuritis* the sensory symptoms are marked, but there is rarely if ever complete anæsthesia, there is no affection of the bladder and rectum, there are no bedsores, there is no oversensitiveness of the spine to heat, and the distribution of the symptoms is peripheral.

In *meningitis* the onset is slower, the fever is high, and the pain in the back, body, and limbs and the hyperæsthesia are severe; there is no anæsthesia, but there are early spasms of the limbs and back, with rigidity of the back; there is only apparent paralysis, due to fear of pain on emotion, no atrophy, no paralysis of the sphincters, no bedsores, and no cystitis.

Treatment.—In the early stages, try to remove the cause. Have the patient lie on the side or face, and cup the spine or apply an ice bag, counterirritation, or a warm douche. Give sedatives, and purge thoroughly with calomel and salts. When the onset is gradual or the course is chronic, use counterirritation to the spine, cups, blisters, and the cautery or ether spray, but not if there is a tendency to bedsores. Baths and douches, tepid or cold, may be used over the spine. The limbs should be massaged and hot baths be given for rigidity. Electricity, vibration, and massage may be used to exercise the muscles. The diet should be regulated, and the general strength kept up as well as possible. Avoid cystitis by aseptic catheterism, and bedsores by careful padding or the use of a water bed, and by sponging with alcohol and alum water. If cystitis or bedsores develop, treat them surgically with antiseptic irrigation and dressings.

For the *pain*, use heat or the faradic brush. Give antipyrine, acetanilide, phenacetin, bromides, morphine, or salicylic acid. For the spasms, we may give bromides and apply heat to the spine or cups or hot baths to the legs. If rigidity appears, we may use mechanical appliances and massage. For *incontinence of urine*, have a urinal worn, or absorb the urine in cotton.

In the chronic cases we may use potassium iodide, strychnine, arsenic, and phosphorus. In the syphilitic cases we should use large doses of mercury and potassium iodide or an inunction course.

ACUTE ASCENDING PARALYSIS (LANDRY'S PARALYSIS)

Ætiology.—This form of paralysis is due to *infection*. It is most common in men between the ages of twenty and thirty.

Pathology.—In some cases no lesions have been found. In others an interstitial neuritis of the nerve roots has caused it to be classified as a peripheral neuritis.

Symptoms.—At first there is a weakness of the legs, which may in a few hours merge into paralysis. This spreads to the trunk, arms, and neck. The muscles of respiration, deglutition, and articulation, and sometimes those of the face and eyes, are affected in a few days. Although the muscles show no wasting or the electrical reaction of degeneration, the reflexes are lost. The sensory symptoms are neither constant nor essential, but there may be numbness, tingling, or hyperæsthesia. The bladder and rectum are seldom involved. The spleen is sometimes enlarged.

The **prognosis** is bad; recovery has taken place only in rare instances. Death may occur in from two days to two weeks.

Treatment.—After a brisk purge we give warm baths and administer sodium salicylate, in 10 to 20 grain doses in water per rectum, three times a day. Sedatives and stimulants may be required.

SYRINGOMYELIA

Syringomyelia is not a very rare disease. It is probably of congenital origin, but it may follow traumatism. It is more common in males before the age of thirty.

Pathology.—A growth of embryonal neuralgia tissue about the central canal of the cord degenerates and forms a cavity filled with fluid. It usually is in the lower cervical and upper dorsal region, but may extend the entire length. According to the degree of extension we observe the symptoms.

The **symptoms** begin insidiously at about puberty and extend for years. Aching pains in the neck and arms are followed by muscular atrophy, first in the hands, then in the arms and trunk. The loss of sensations of temperature and pain, while those of touch and location are retained, is almost pathognomonic. The legs become involved late in the disease and show a spastic paraplegia. Curvature of the spine usually results from involvement of the spinal muscles. Cyanosis, œdema, sweating, ulcers, bullæ, defective growth of the nails, and brittleness of the bones result from the vasomotor, secretory, and trophic disturbances. Felons may arise. If the lumbar cord is involved, there is loss of control of the sphincters.

Diagnosis.—We distinguish the disease by the sensory pathognomonic signs (loss of the senses of temperature and of pain, retained touch and location sensations) and the combination of an amyotrophic paralysis, and progressive muscular atrophy of the Aran-Duchenne type.

The **prognosis** is bad. The disease extends over years. In the later stages the disease resembles chronic muscular atrophy. Death may result from involvement of the medulla.

The **treatment** is symptomatic. It is important, then, to warn patients suffering from beginning syringomyelia of the necessity of taking the greatest possible care of the affected member, in order to avoid the accidents to which it is liable because of the disturbed sensory condition of the part.

CEREBROSPINAL SCLEROSIS (MULTIPLE OR DISSEMINATED SCLEROSIS)

This is a rare chronic disease, affecting the brain and spinal cord together.

Pathology.—There are regions scattered throughout the entire nervous system where sclerotic connective tissue replaces the normal nerve elements.

Ætiology.—The cause is obscure. It regularly is a sequel of the infectious diseases, measles and scarlet fever in particular, and is found most frequently in young persons.

Symptoms.—The onset is slow and the disease is chronic. Headache, vertigo, malaise, mental irritability, inattention, imperfect memory, lack of self-control, and inability to work gradually develop. Later there develops a tremor of the hands, increased by the effort to hold them still, and finally there is a general intention tremor. The legs early become weak and stiff, and finally a spastic gait develops. The knee jerk is increased. Nystagmus and "scanning speech" (slow, each word separately enunciated without variation in tone) are observed. Optic atrophy is rare. Dementia, attacks of epilepsy, and hemiplegia may finally occur.

The **course** is very irregular, and the symptoms may disappear for months and then return. The patient dies from some other disease or finally becomes bedridden.

The **diagnosis** is made from the intention tremor, scanning speech, and nystagmus. The reflexes are exaggerated.

Treatment.—None seems to prevent the progress of the disease.

DIVERS' PARALYSIS (CAISSON DISEASE)

Persons who work in diving-bells or under increased atmospheric pressure are likely to have this disease if they emerge suddenly into the normal atmosphere. The longer they remain in the caisson, and the more suddenly they return to the normal atmosphere, the more likely they are to have the disease. Those unaccustomed to the work are most likely to be attacked.

Pathology.—Small hæmorrhages are found in various localities of the body, together with *emboli of free gas in the circulation.*

The **symptoms** may appear at once or may not occur for half an hour after leaving the caisson. Usually there are very severe pains in the limbs, the legs are tender to the touch, and there is some loss of motor power. Epigastric pain, nausea, vomiting, headache, and dizziness are likely to occur. Paralysis and anæsthesia may rapidly develop in the legs, although the neuralgic pains continue. A temporary loss of consciousness sometimes occurs.

Prognosis.—Convalescence may take place in a few days or be delayed for months, with continuous suffering and paralysis. In severe cases the patient may pass into coma and die in a few hours or days. Atrophic bed-sores and cystitis sometimes develop. Permanent paraplegia is occasionally a result.

Treatment.—The prophylaxis consists in allowing sufficient time for passing through the lock, where the pressure is reduced. At least five minutes should be allowed for each atmosphere. The workmen should be gradually accustomed to the occupation, and the hours should at first be short. If the symptoms begin, the patient should immediately be put back under a slight atmospheric pressure.

In the acute stages ergot in large doses seems to be of service. In the paralytic stage the treatment is the same as in myelitis.

CRANIAL NERVE PALSIES

Disease of the **third nerve** or pressure upon it gives rise to external strabismus, ptosis, dilatation of the pupil, loss of the pupil reflex and of accommodation to distance, and diplopia. The paralysis may be due to a neuritis, especially one associated with locomotor ataxia, and may follow diphtheria or may be due to pressure from the exudate of a meningitis, tumor, or aneurysm, or to rheumatism, syphilis, or to an attack of migraine. The excessive use of tobacco is also a cause.

The course is usually subacute, lasting for a few weeks. Functional palsies last only a few days, and the periodical palsies occur once in a year or six months. The latter are accompanied with some pain at first, and last a few days or weeks. Syphilitic palsies last from one to three weeks, but are apt to relapse and to be very obstinate.

Treatment.—Treat the underlying cause and apply faradism, galvanism, and vibration.

A **fourth nerve** palsy is rare. Convergent strabismus and diplopia result. The causes are the same as those of third nerve palsies.

Fifth Nerve Palsies.—These may be nuclear, central, meningeal, or peripheral in origin. Those of central origin usually accompany hemiplegia. Palsy of nuclear origin is rare. It usually accompanies glossolabial or diphtheritic palsy or some gross lesion of the pons. When it is of meningeal origin, from tumors, meningitis, or fracture at the base of the skull, it is usually accompanied by lesions of the other cranial nerves. Syphilis is often the cause. The temporal and masseter muscles are paralyzed and the jaw, when depressed, moves toward the paralyzed side. Both speech and swallowing are interfered with. Through a little branch of the fifth nerve passing to the tensor tympani, we may get deafness and tinnitus aurium, when the fifth nerve is affected.

Sixth nerve palsy is the most frequent, and it causes convergent strabismus and diplopia. Locomotor ataxia and syphilis are most often associated with this form of palsy.

Facial (Seventh Nerve) Palsy (Bell's Palsy).—This common type of peripheral paralysis is usually due to exposure and rheumatic infection. It occurs most often between the ages of twenty and forty, and in males. Winter is the season in which we find it most often. A neuropathic or rheumatic tendency predisposes to it. In syphilis we rarely observe a facial paralysis. It may occur in multiple neuritis and locomotor ataxia. Some cases, not typical, however, are due to injuries (such as fracture of the petrous portion of the temporal bone) or ear disease. The use of the forceps in labor has caused some cases and a few have been congenital.

SYMPTOMS.—The disease comes on suddenly and reaches its height within a few hours or at most within two or three days. Some pain and swelling around the ear may precede it. The appearance of the face is characteristic. On the affected side there are no wrinkles, the angle of the mouth is lower, and the mouth is drawn toward the sound side. Owing to this, it looks as if the tongue could not be protruded straight. In trying to wrinkle the face, as in laughing or showing the teeth or making a grimace, the paralysis is distinctly shown. The eye on the palsied side cannot be perfectly closed, and the eyeball turns up. The eye is likely to be watery and the conjunctiva somewhat injected. The nostril on the paralyzed side does not expand on forced inspiration. If the disease extends into the Fallopian canal, paralyzing the stapedius muscle, there is oversensitiveness to sounds. By noting the ear and taste involvements, the situation of the lesion can be accurately determined. Some wasting of the face may usually be made out after a few weeks.

There are great variations in the electrical reactions, which are in proportion to the severity of the case. Typical or partial degeneration reactions can usually be observed. The patient feels a subjective discomfort on the paralyzed side. He cannot pucker the lips or close the eye on that side. In chewing, the food gets between the cheek and teeth. The speech is slightly muffled. *Secondary contractures* begin to appear if the disease lasts for two months or more, and the mouth is drawn toward the affected side. The nasolabial fold becomes deeper than on the sound side.

PATHOLOGY.—In its typical form, the disease is due to a diffuse neuritis of rheumatic character.

DIAGNOSIS.—By asking the patient to make a grimace we get the characteristic expression. It is important to find out whether the palsy is cerebral, nuclear, basilar, or peripheral. If it is cerebral in origin, the upper branch is little affected and the patient can close his eye. There is no reaction of degeneration.

NUCLEAR PALSY is very rare. There are other symptoms, especially those of the involvement of other cranial nerves. A history of diphtheria, lead poisoning, or bulbar paralysis can usually be obtained. If it is *basilar* in origin, such as is due to a gummy meningitis, there are signs of brain syphilis and the involvement of other cranial nerves. Most cases are peripheral in origin.

The PROGNOSIS of Bell's palsy is good, although often there is not complete recovery. If it is syphilitic in origin, the prognosis is good. If it is of central origin, the prognosis is not good. The paralysis of peripheral origin usually lasts from three to five months, but very mild cases become normal in a month. According to the completeness of the reaction of degeneration is the prognosis as to duration.

TREATMENT.—Acute peripheral palsies demand prompt purging and diuresis and a blister over the exit of the nerve. Hot fomentations may follow. Salicylate of sodium in full doses should be given for a week. After the paralysis is established, give potassium iodide in moderate doses. Electricity should be used carefully at first. After a week, give it daily for five minutes, and use the galvanic current, just strong enough to contract the muscles. Vibratory massage is efficacious. If after a time the faradic current causes a contraction, it may be used. After a month, the applications can be made on alternate days. If the paralysis is severe, a mechanical device may be used during the day to hold up the corner of the mouth, such as a hook fastened behind the ear. The eye should be protected.

Glossopharyngeal (ninth nerve) paralysis is described under Paralyses of Central Origin (Glossolabiolaryngeal Paralysis).

Pneumogastric (tenth) Nerve Paralyses.—The nucleus may be involved by hæmorrhage, tumor, softening, or slow degeneration. In bulbar paralysis the nucleus of this nerve is involved. The nerve root may also be involved within the cranium. In the neck, the pneumogastric may be injured by wounds or accidentally during operations. As there are branches to the pharynx, larynx, lungs, heart, œsophagus, and stomach, we shall speak of these branches separately.

1. A paralysis of the pharyngeal branches, from bulbar degeneration, or a post diphtheritic neuritis causes difficulty in swallowing and permits food to enter the larynx or, if the soft palate is also involved, to be regurgitated through the nose.

2. A paralysis of the laryngeal branches may cause a variety of symptoms, which are described in the section on the Throat.

3. A lesion of the pulmonary branches is supposed to exist in the shape of a neurosis, when there is bronchial asthma.

4. *Paralysis* of the cardiac branches abolishes the inhibitory action, and we observe *tachycardia.* It may occur with a diphtheritic neuritis, wounds, or accidental injuries of the vagus, or the nerve trunk may be involved by tumors or by poisons depressing the vagus nucleus. *Irritation* of the nerve causes a slowness of the heart's action. *Bradycardia* may follow irritation of the nucleus, as by compression by tumors, or it may be a pure neurosis.

5. *Paralysis of the œsophageal branches* gives rise to difficulty in swallowing, which may simulate stricture.

6. Paralysis of the *gastric branches* may cause a partial loss of power of the stomach to contract.

The TREATMENT of all such conditions depends upon the underlying cause.

The spinal accessory (eleventh nerve) paralyses are seen in loss of function of the sternomastoid and trapezius muscles. This nerve is concerned in some cases with the pneumogastric in bulbar paralysis.

The hypoglossal (twelfth) nerve is also concerned in bulbar paralysis. When the trouble is nuclear in origin, it may occur with locomotor ataxia or from acute softening from obstruction of blood vessels, and the symptoms are usually bilateral. The tongue atrophies. If the cause is supranuclear, paralysis of the tongue occurs on the side opposite to the lesion, and the tongue does not waste. It is usually associated with hemiplegia. If the cause is infranuclear, it may be from tumor, meningitis, pressure from bony caries, or a neuritis from rheumatism or lead poisoning. The tongue atrophies, and the reaction of degeneration is present.

SYMPTOMS.—In bilateral palsy the tongue cannot be protruded. In unilateral paralysis it deviates toward the paralyzed side when protruded. According to the extent of the paralysis is the interference with articulation and mastication.

NEURITIS

Ætiology.—Ordinarily, neuritis, an inflammation of nerve substance, takes place in a single nerve, but it may involve a plexus. Injuries, strains, pressure, compression, rheumatism, gout, infection, and occasionally the various toxines, as described under Multiple Neuritis, may affect a single nerve.

Pathology.—There are two forms of inflammation, the parenchymatous and the interstitial, and the different microscopical structures show changes.

Regeneration occurs by growth of new fibres outward from the healthy portion into the old sheath.

Symptoms.—The muscles supplied by the nerves involved show weakness or paralysis with atrophy and the reaction of degeneration. The skin of the region of the diseased nerve is numb or anæsthetic. Vasomotor and trophic changes, such as coldness, glossy skin, and œdema, are present. There are pain and tenderness, in the interstitial cases, at the point of inflammation.

Course.—When the continuity of the nerve is preserved, there is slow and spontaneous recovery. Otherwise there is no recovery.

Treatment.—Unite the ends of the broken or cut nerve in injury cases. Rest the injured part, but exercise the muscles which are paralyzed by massage and electricity. Hot applications, sedative lotions, and protection from the cold by cotton batting are useful. The pain may demand morphine.

Multiple Neuritis

Multiple neuritis is an inflammatory or degenerative disease of the peripheral nervous system. It affects symmetrical parts of the body and varies in different cases in extent and severity.

The **pathology** is the same as in simple neuritis, and the inflammatory changes may be of both types or of either alone.

Ætiology.—*Toxic Cases.*—Alcohol, wood alcohol, lead, arsenic, bisulphide of carbon, copper, zinc, mercury, phosphorus, and coal gas are causes. Occasionally we see cases from excessive tea drinking. Ether, naphtha, ergot, and morphine are mentioned as causes.

Cases Caused by Infectious Poisons.—Diphtheria, typhoid fever, scarlet fever, measles, malaria, leprosy, beri-beri, grippe, smallpox, syphilis, rheumatism, tuberculosis, etc., are causes.

Autotoxic Cases.—Gout, diabetes, etc., may give rise to the trouble.

Cases with Cachectic Conditions.—Anæmia, tuberculosis, syphilis, septicæmia, cancer, general malnutrition, or diabetes may be present.

Symptoms.—The onset may be acute or subacute with or occasionally without fever. We observe the symptoms of a simple neuritis, but there are different types according to the different causes.

1. SENSORY SYMPTOMS are first to occur. There is sharp, severe pain located in the limbs, both along the nerves and in the muscles, which is increased by pressure or motion.

Paræsthesia occurs, such as burning, tingling, numbness, formication, and the sensation of a band about the legs or body.

Anæsthesia, symmetrical, in the tips of the fingers and toes, extending up the limbs, is present.

Ataxia is observed in the finer movements, also loss of the sense of position.

2. MOTOR SYMPTOMS.—*Paralysis.*—This appears in the extensor muscles, and we note dropped wrist or foot, with inability to walk or move about in bed. There may be paralysis of the cranial nerves. Contractures may develop. After the paralysis, atrophy develops rapidly, with loss or change of the electric contractility. There is no incontinence of urine. The deep reflexes are lost.

3. TROPHIC SYMPTOMS.—With the vasomotor paralysis we see glossy skin, œdema, abnormal growth of the nails and hair, profuse sweating, and urticaria. There are no decubitus bedsores.

Alcoholic neuritis is the most common form, and it occurs more frequently in women than in men. It resembles myelitis. The onset is usually sudden, with a chill and fever from 101° to 103°. There are usually delirium and delusions, with, later, an imperfect memory for recent events. The paralysis becomes complete with great pain and dropped wrists and feet. The anæsthesia, tremor, and tenderness are marked. In another form all the symptoms of locomotor ataxia, except those of the bladder and rectum, develop rapidly. In either form death may occur from heart failure or exhaustion. However, we usually see a rapid increase of symptoms for three or four weeks, with a period of about two months during which the symptoms remain almost stationary, and then a slow recovery. The disease lasts from six to sixteen months. The combination of anæsthesia of the skin with extreme hyperæsthesia and soreness of the muscles is highly suggestive of alcoholic neuritis.

Cases Following or Complicating the Infectious Diseases.—Diphtheritic neuritis is the most common. The paralysis begins in the uvula and may involve the muscles of the palate, eye, or heart, or be generally distributed in the extremities. There are usually no sensory symptoms. The paralysis is usually in the form of paraplegia. The duration is commonly about three months.

Lead Paralysis.—There is usually a preceding colic, with anæmia, constipation, and the lead line on the gums. The onset of the palsy may be abrupt or gradual. It is without sensory disturbances, except rarely, when it may be accompanied with delusions.

The prognosis of lead palsy is good, recovery gradually taking place in about four months.

In *arsenical cases* there is usually a stomach disturbance at first. They resemble alcoholic cases. Paralysis with ataxia, tremor, atrophy, and great numbness, but with little pain, develops. The legs and arms are equally affected. "The steppage gait" is usually well marked. Recovery, according to severity of the neuritis, takes place in from two to six months.

In *coal gas neuritis* the disturbance is chiefly sensory and not severe. Numbness remains for a long time in the fingers, hands, and feet.

Epidemic neuritis, beri-beri, or kakké is a disease which occurs endemically in northern Brazil, China, Japan, India, the Straits Settlements, and the Malay Archipelago. It is probably due to infection, and occurs in several types—the acute pernicious, chronic œdematous, and chronic atrophic. At times it assumes epidemic proportions. Foreigners in the endemic localities are usually exempt.

A **gouty neuritis** is sometimes seen in people who have other gouty manifestations. They develop numbness and tingling, beginning in the feet or hands, and extending upward. The tingling is worse at night. There is weakness of the muscles, and the patient cannot walk far. It never goes on to paralysis or ataxia.

Paralysis of the Musculospiral Nerve.—This produces "*wrist drop*" and inability to extend the last phalanx. The fingers can be only slightly abducted; supination is lessened or lost; the triceps may be involved, weakening the power to extend the forearm. Atrophy may be present, also the degeneration reaction. There may be a swelling over the tendons of the wrist, some numbness and tingling, and some anæsthesia.

In addition to the usual causes of neuritis, *paralysis of the musculospiral* nerve is frequently due to pressure on the nerve during sleep and anæsthesia, also to crutches, fractures, wounds, and tumors. If it is due to pressure, and the pressure is removed, it lasts but a few weeks.

Paralysis of the Circumflex Nerve.—In such cases it is impossible for the sufferer to elevate the arm or rotate it outward. Atrophy, anæsthesia, and sometimes pain are present.

Differential Diagnosis of Neuritis.—We distinguish neuritis from anterior poliomyelitis by the pain and tenderness along the nerves, by the other sensory symptoms, and by the symmetrical distribution of the paralysis; from locomotor ataxia by the rapid onset, the paralysis occurring early, the preservation of control of the bladder, and the absence of the Argyll Robertson pupil; from myelitis by the absence of bladder and rectum affections, the absence of bedsores, the absence of oversensitiveness of the spine to heat, and the peripheral distribution of the symptoms.

Prognosis in Neuritis.—In the majority of cases it is good. In beri-beri there is a high mortality. The recovery is slow. When the heart becomes rapid and the respiration poor, showing an involvement of the pneumogastric nerve, the prognosis is bad.

Treatment of Neuritis.—Enjoin rest in bed, order salicylic acid or the salicylates in the early stages, where there is fever, and make warm applications to the affected limbs by means of packs or baths. After the acute stage has passed, we employ massage, vibratory stimulation, and warm baths at 98° F. for half an hour, several times a day. Electricity in the form of the galvanic or faradic current may be passed through the nerves and applied to the muscles. Contractures should be avoided by passive movements and proper position of the limbs. Alcohol should not be given, except in the alcoholic cases, where it should be gradually reduced. Iodide of potassium is indicated in lead neuritis. The diet should be nourishing, but well regulated. Iron, quinine, and strychnine are indicated as general nerve tonics. For the pain, we may be obliged during the acute stage to give sedatives (phenacetin or morphine). In the chronic stage give arsenic and urge hydrotherapeutic measures.

DISTURBANCES WITH LOSS OF CONSCIOUSNESS PREDOMINATING

VERTIGO

Vertigo, a pathological *symptom*, is characterized by giddiness, dizziness, or the sensation of lack of equilibrium. When external objects seem to whirl around, it is said to be *objective*, and if the person himself seems to move, it is called *subjective*. In rare cases it seems to be idiopathic.

Ætiology.—Vertigo is observed from anæmia, hyperæmia, toxæmia, intestinal toxæmia, alcoholism, the abuse of tobacco, arteriosclerosis, neurasthenia, epilepsy, and organic brain and spinal cord disease, such as tumor and hydrocephalus. We observe reflex vertigo due to eye strain, gastrointestinal irritation, acoustic nerve irritation (Ménière's disease), or mechanical causes (swinging and electricity).

Vertigo may be chronic or nearly so. The severe chronic form is called the *status vertiginosus.* Vertigo is increased by rising or sudden motions and diminished by lying down.

Auditory vertigo, or Ménierè's disease, is described under that head.

Stomachic vertigo, accompanied by loss of consciousness, is a severe form. It occurs generally in persons whose stomachs are overloaded.

Bilious and **lithæmic vertigo** are vague terms applied to conditions caused by *indigestion.* Dyspepsia, constipation, gout, and disordered stomach and bowel conditions create a toxic state of the blood which irritates the nervous centres. It is paroxysmal, being worse in the morning, is often accompanied by nausea, and is not very severe.

Ocular vertigo denotes refractive errors and inequality of the action of the eye muscles.

Neurotic Vertigo.—The form accompanying epilepsy is described under that head. Brain tumors and acute and chronic hydrocephalus give rise to vertigo.

Neurasthenic vertigo is common. It is generally subjective and not severe, although it may cause much alarm. The attacks are short and may be accompanied by nausea or syncope. There is a form coming on in attacks which resemble seasickness, and they are analogous to other nervous crises. There is intense vertigo, coming on suddenly, with nausea and faintness, and lasting for some hours. Beyond overwork and excitement, there is no known cause. A form called "stumbling vertigo" is sometimes seen in neurotic individuals. There is a sudden "giving way" of the legs without consciousness of any vertigo. Patients with Graves's disease sometimes have this symptom.

Mechanical Vertigo.—Swinging, whirling, and the movements of a ship, steam car, or elevator give rise to this form of vertigo in some people because of an irritation of the ocular and auditory nerves.

Arteriosclerotic and Senile Vertigo.—Impaired nutrition of the brain, with consequent anæmia, may be the result of arterial changes. A weak and fatty heart may cause vertigo.

DIAGNOSIS.—Try to ascertain the cause by noting whether the vertigo is subjective or objective, paroxysmal or chronic, and whether it is accompanied by ear symptoms, nausea, vomiting, or loss of consciousness. The auditory, gastric, toxic, and neurasthenic forms are the most common. Examine the arteries of elderly people and think of epilepsy in the young.

PROGNOSIS.—Epilepsy and organic disease give rise to the most serious forms. All the other forms can usually be relieved.

Treatment.—The horizontal position, rest, and volatile stimulants are applicable to the attack. Then remove the cause if possible.

DELIRIUM

Delirium may be defined as a disturbance of the cerebral functions, manifested in the impaired action of the nerve centres, characterized by

Differential Diagnosis and Treatment of Coma

	Uræmic Coma.	Apoplectic Coma.	Alcoholic Coma.	Diabetic Coma.	Opium or Morphine Coma.	Belladonna Coma.	Coma in Hepatic Cirrhosis or Acute Atrophy.	Coma and Asphyxia: from Gas, Foul Air, or Carbonic Oxide.	Coma in Brain Injury, Cerebral Concussion.
History and onset.	Acute or chronic nephritis, delirium, convulsions, profound coma.	Follows in the wake of sudden hemiplegia.	Follows alcoholic delirium.	History of diabetes, slow onset.	Onset gradual.	Dry mouth and throat, coma preceded by delirium.	History of alcohol, syphilis, or infection.	Breathing illuminating gas or bad air or coal gas.	Onset immediately after injury.
Examination.	Pale, cyanotic, œdematous face or general dropsy, stertorous breathing, usually fever temperature, full pulse, albumin and casts in urine, repeated convulsions, no sign of injury or paralysis.	Pale skin, no sign of injury or hæmorrhage, paralysis evident, slow stertorous breathing, irregular, weak pulse, sometimes fever, involuntary flow of urine, profound stupor, deviation of tongue.	Congested face and eyes, hot skin, no paralysis or tongue deviation, usually no fever, rapid respiration, large pupil, strong pulse, alcohol breath, vomiting, seldom convulsions, urine retained, no visible injury, can be aroused.	Pale skin, no paralysis, rapid, shallow breathing, normal temperature, rapid, weak heart, sweet or acetone smell to breath, sugar in urine, no convulsions as a rule, profound stupor.	Pale, cool skin, no paralysis, pupil contracted, slow, irregular respiration, difficult to rouse patient.	Skin flushed and dry, slow, deep respiration, dilated pupils, rapid pulse, retained urine.	Body jaundiced, sallow, emaciated, small liver, large spleen, sign of portal obstruction, epistasis, hæmatemesis, or bloody stools, may have delirium or convulsions.	Mucous membranes livid and blue, noisy respiration, pulmonary œdema, small, rapid pulse, sometimes convulsions.	Skull usually not fractured, no profound paralysis, pupils equally contracted and reaching to light, slow, shallow breathing, weak pulse, may be rapid and irregular, incontinence of urine.
Treatment.	Enema, venesection, hot pack, draw urine with catheter, enteroclysis at 115° F., decapsulation of kidneys.	Enema, venesection, ice to the head, hot water bottle to the feet, feed with care, gavage, absolute rest, keep lips and nose moist rectal feeding.	Enema, catheter, cold to head, heat to body, keep lips moist, also nose, sustain heart, enteroclysis at 110° F.	Enema, catheter, keep lips and nose moist, enteroclysis at 110° F., sustain heart, saline hypodermoclysis, morphine, in case of convulsive seizures.	Wash stomach, enema, catheter, strong coffee, artificial respiration, flagellation, atropin sulph., gr. $\frac{1}{60}$, hypodermically, strong faradic current.	Emetics, stomach washing, catheter, enteroclysis, hypodermoclysis, hypodermic stimulation.	Symptomatic, about same as in diabetic coma.	Fresh air, artificial respiration, hypodermic injection of whiskey and digitalis.	Rest, cold to head, light diet, gavage, stimulation, enema, enteroclysis. Surgical aid.

Differential Diagnosis and Treatment of Coma

	Cerebral Compression, Meningeal Hæmorrhage.	Coma in Meningitis.	Epilepsy, Postepileptic Coma.	Coma in Insulation, Heatstroke.	Coma in Sunstroke.	Coma in Freezing.	Coma in Lightning Stroke.	Syncope, Cerebral Anæmia.	Feigned Coma, Hysteria.
History and onset.	History of injury, may recover and relapse some hours afterward.	History of meningitis, coma after days and weeks of illness.	History of epileptic seizures.	Exposure combined with physical exertion and alcoholism, onset sudden or gradual.	Exposure to sun combined with fatigue and alcoholism, onset abrupt or preceded by pain in head, vertigo, nausea.	Exposure to intense cold combined with fatigue, hunger, and alcoholism.	Death or coma.	Sudden onset.	Occurs in males, but more in females, also in children, onset sudden.
Examination.	Skull often fractured, blood and serous discharge from nose or ears, localized and general paralysis, pupils first unequal, then dilated and no reaction to light, respiration may be of Cheyne-Stokes type, pulse first slow, afterward rapid and irregular, retention of urine, increasing stupor.	Conjunctivæ congested, tâche méningitique, Kernig's sign, sphincter paralysis, pupils dilated with intracranial effusion.	Pale or cyanotic skin, frothing at mouth, tongue bitten, seminal discharge, pupils react to light, pulse, temperature, and respiration not characteristic.	Skin cool and clammy, face pale, pulse rapid and feeble, involuntary discharges, coma yields to treatment.	Pulse rapid and bounding, stertorous breathing, skin hot and dry, eyes suffused, temperature very high, delirium, convulsions, rigidity after recovery, pain in head may continue and mental weakness, chronic meningitis, and insanity result.	Comatose condition and varying degrees of frost bite, from congestion to blistering and gangrene.	Superficial or deep burns, disturbance of vision after return of consciousness, or paralysis in some cases.	Pale, clammy skin, sometimes nausea, slow, weak heart, sighing respiration, sometimes convulsions, coma of short duration.	Examination reveals nothing particularly abnormal; coma may alternate with hysterical crying.
Treatment.	Rest, cold to head, light diet, gavage, enema, enteroclysis, operation, rectal feeding.	Symptomatic; catheter, enteroclysis, feeding by gavage, rectal feeding.	Symptomatic; wait for consciousness.	Cool douche and friction, warm baths, stimulation, fresh air to breathe, camphor, whiskey, digitalis.	Cold applications, tubbing at 60°, or cold pack, cold enemata, venesection, stimulation, ice to head.	Preventive by protection and maintenance of circulation, application of warmth, stimulation; chilblain, when recent, may be rubbed down with snow; when of long standing, massage is indicated; gangrene is treated antiseptically.	Artificial respiration, external heat, stimulation.	Loosen the clothes, lower the head, cold douche, ammonia to nose, hypodermic of whiskey or strychnine.	Look wise and say little: feigned coma is very misleading.

hallucinations, incoherence of speech, a staggering gait, etc. There is dissolution of the "ego" for the time being. It may be due to high fever or to the *poison* causing the fever, as in typhoid or scarlet fever. In such cases it has no important significance *beyond denoting a severe infection.* It may appear before and after the crisis, and may be a *sign of weakness and collapse* (inanition of the brain).

The delirium from toxæmia may be mistaken for meningitis. Delirium from alcoholic poisoning may be acute or it may be due to chronic alcoholism, as in delirium tremens.

Various forms of *functional* and *organic* nervous and mental disease may be accompanied by delirium.

Treatment.—When active delirium is due to *toxæmia,* with a *high temperature,* hydrotherapeutic measures are indicated (see General Therapeutics). When there is the low, muttering delirium of excessive weakness or collapse, active stimulation is indicated.

COMA

Coma may be defined as abnormally deep and prolonged sleep, with the cerebral functions in abeyance. It may be caused by a number of different factors, and it is many times impossible to determine the cause in an unconscious person, seen for the first time in coma and without a history.

The table (pages 716-717) will prove an aid in distinguishing the different causes leading to coma, and in establishing proper treatment.

ECLAMPSIA; CONVULSIONS

Convulsions are abnormal and exaggerated muscular contractions occurring in rapid succession. They may be *clonic,* a rapid and alternate contraction and relaxation of the muscles in an exaggerated or irregular way, or *tonic,* a steady and continuous contraction. A *cramp* is a painful tonic contraction of a muscle. Convulsions may be coordinate, when the limbs and body are moved about in a more or less purposeful way. The patient throws himself about on the bed, jumps, strikes, kicks, tears the clothes, etc. There is usually loss of consciousness with convulsions.

Convulsions occur in epilepsy, at the onset of acute infectious disease, especially in children; in hysteria, extension of inflammation of the middle ear, in concussion of the brain, in cerebral anæmia, in cerebral hæmorrhage, in cerebral syphilis, in general paralysis, in infantile hemiplegia, in meningitis, in sunstroke, after aspiration of pleural fluid (rare), in acute yellow atrophy of the liver, in chronic Bright's disease, in the form of puerperal eclampsia, in uræmia, in rickets, in indigestion, in tetany, in hepatic colic, in hydrophobia, in typhoid fever, in tetanus, in alcoholism, in poisoning, and from many other causes.

The **symptomatic management** of convulsive seizures is discussed in the section on Pædiatrics.

PUERPERAL ECLAMPSIA

This is an acute derangement which may occur in the pregnant, parturient, or puerperal woman, characterized by clonic convulsions with loss of consciousness and coma. Although the kidneys, liver, and brain, together or separately, particularly the kidneys, show pathological changes of varying and inconstant severity at the autopsy, they are not severe enough to indicate them to be the characteristic lesions of the disease. It is probable that convulsive seizures are caused by some unknown toxic material circulating in the blood (*convulsive bodies*).

Symptoms.—From 70 to 80 per cent of the cases occur in primiparæ. As a rule, it does not occur until after the second half of pregnancy, and it becomes more frequent as pregnancy advances. Twin pregnancies and hydramnios seem to predispose to the disease.

A convulsion may occur without warning in an apparently healthy pregnant woman, but usually there are premonitory signs, such as albuminuria, œdema, headache, epigastric pain (an important sign), and possibly disturbance of vision. It may come at any time, even during sleep. If the patient is awake, the first sign is a fixed expression of the eyes, which soon begin to roll from side to side. The pupils are usually dilated, but they may be contracted. The convulsive movements appear first around the mouth, which twitches and is drawn to one side. The whole face becomes distorted, and the convulsions rapidly extend to the arms, body, and legs. They are usually clonic in character, but sometimes the patient may become rigid in a tonic spasm. The breathing becomes stertorous, the face grows congested and flushed, and the patient foams at the mouth and often bites her tongue. It may last from a few seconds to two minutes, and there is absolute unconsciousness during this time. A condition of coma follows, lasting for a variable time. It may last from one convulsion to another, and the patient may die without recovery of consciousness. If the convulsions are infrequent, consciousness is usually regained after each convulsion.

If the attack occurs during the latter part of labor or during the puerperium, there is often but a single convulsion, with recovery. More often one convulsion is followed by another. In mild cases there are one or two, and in fatal cases there may be as many as a hundred. In rare instances they may follow one another so rapidly that the patient seems to remain in a continuous convulsion.

Usually the arterial pressure is markedly increased, with a full, bounding pulse. In severe cases it is weaker, thready, and more rapid. The temperature is very high in many cases, 104° or 105° not being unusual, and it may be 107° or 108° in fatal cases. Sometimes it remains normal. Most clinicians agree that the largest number of cases occur during labor, the next before labor, and the last after labor.

If the attack occurs before labor, the pains may begin and the child be born spontaneously, or the patient may recover and at term be delivered of a living child, or she may recover and at some future time be delivered of a dead fœtus, or she may die undelivered. In exceptional cases she may recover from the attack and, after being perfectly well for a longer or shorter period, have a recurrence of the seizure. If the attack occurs first during labor, the pains increase in frequency and severity, and the child is born sooner than usual. The convulsions usually cease after delivery. The patient may die undelivered unless some operative procedure for delivery is adopted. The postpartum attacks usually come on soon after delivery, and recovery often follows one convulsion. In some postpartum cases, however, there may be many convulsions, and occasionally death may result. In a small number of cases the patient becomes jaundiced, and the prognosis is grave.

The *urine* during an attack is markedly diminished in amount and contains many casts and often blood. Occasionally there is complete suppression. Nearly always albumin is present in large amounts, and the urea is greatly diminished. In favorable cases, after the convulsions the urine and urea are increased and the albumin diminished. Usually the urine improves rapidly and in a few weeks may appear normal. There may, however, be albumin and casts in the urine for months afterward. Death usually results from œdema of the lungs, apoplexy, aspiration pneumonia, or a puerperal infection.

Diagnosis.—If the patient has been under observation during her pregnancy, the diagnosis is easy. If she is seen for the first time in convulsions or coma, we have to distinguish the cause from uræmia, epilepsy, and hysteria.

Prognosis.—The disease is always grave, being considered one of the most serious of obstetrical complications. The maternal mortality is from 20 to 25 per cent and the fœtal is from 33 to 50 per cent. Each convulsion makes the outlook more serious. Death may occur after the first convulsion, and recovery after as many as thirty. If the pulse remains good, firm, and full between the attacks, the outlook is usually good; if it becomes weak, rapid, and thready, it is usually a bad sign, especially if accompanied by high fever. The most serious complications are apoplexy, paralysis, and pulmonary œdema, which usually result fatally.

Treatment. — PROPHYLACTIC. — From the beginning of pregnancy, a woman should be instructed in regard to the necessity of keeping all the emunctories in perfect working order. The kidneys should secrete freely and much fluid be taken. The bowels should move freely every day. The skin should be kept in perfect order by means of baths and exercise. The lungs should have plenty of fresh air. Exercise is imperative, and walking is one of the best exercises.

The urine should be examined every month until the last month, when it should be examined every week. The patient should notify her physician of headache, disturbance of vision, œdema, or epigastric pain. If we find albumin in the urine, we should get a twenty-four hour specimen and ascertain the total amount of albumin and urea. If the urea is normal (16 to 30 grammes per diem), and there is a slight amount of albumin, the significance is not important. If there is considerable albumin and the urea is diminished, the patient is in a serious condition. The patient should be put to bed and placed on a fluid diet. After a few days she can have soft diet. She should drink a good deal of fluid, such as water, lithia water, peppermint tea, and lemonade. The result of this treatment is usually good. If not, give a saline purge daily and a hot pack or sweat bath daily. If there is improvement, the prognosis is good. If the albumin increases and the urea diminishes in spite of treatment, the prognosis is bad, and labor must be induced.

Curative Treatment.—When the convulsions begin, chloroform should be given, and then morphine, gr. ¼, to be repeated twice if necessary. Diuresis must be provoked by means of hot packs. A strong cathartic must be given, such as one drop of croton oil in ℥j of olive oil. If the patient is unconscious, it can be dropped on the back of the tongue. Place something between the teeth, such as a folded handkerchief, to prevent the biting of the tongue. No food or medicine should be given by the mouth during unconsciousness. Terminate labor as soon as is possible with safety. If the fœtal head is low down after dilatation is complete, apply the forceps. If it is above the brim, perform version. If the attack comes before labor has begun, use a steel dilator to make space enough for the Champetier de Ribes balloons.

After delivery, do not try to check hæmorrhage until a considerable quantity of blood is lost, as this loss is helpful. Promote diuresis and catharsis. Give salines per rectum and subcutaneously, according to need. A continuous irrigation of the rectum with saline solution at 115° F. is one method of treatment. If the hæmorrhage is slight, venesection may be necessary. In urgent cases *decapsulation of the kidneys*, according to the method of Edebohls, is indicated.

EPILEPSY

Idiopathic epilepsy is an organic disease of the cerebral cortex characterized by attacks of unconsciousness with general convulsions.

Jacksonian epilepsy, partial epilepsy; cortical epilepsy; symptomatic epilepsy is usually symptomatic in form, and is characterized by periodical convulsions affecting only certain groups of muscles and often unattended by unconsciousness. It is due to disturbance of the projectional motor centre.

Hysteroepilepsy is a form of hysteria.

Idiopathic epilepsy is seen in three forms, *grand mal, petit mal,* and *psychical epilepsy.*

Petit mal is the form where there is an attack of unconsciousness, but no convulsion.

Grand mal is the form where there is unconsciousness with convulsions.

Psychical epilepsy is a rarer form characterized by acute mental disorders.

Ætiology.—Heredity is the most important of remote causes, as a neurotic family history can be obtained in about one quarter of all cases. It is rare to have a history of epilepsy in the father or mother, but we often find one or both suffering from a nervous disease or alcoholism. Epilepsy or insanity is found in the family history of about one third of the cases. Intermarriage of neurotic persons contributes powerfully toward the tendency to convulsions in children. We find an exciting cause in about one third of the cases. Blows on the head, dissipation, fright, and continued reflex irritation act as causes. Acute infectious diseases, powerful emotions during pregnancy, injuries during labor, and syphilis have some influence. Rickets, sunstroke, masturbation, eye strain, ear irritation, dyspeptic states, and lesions involving the peripheral nerves are among the more important of the exciting causes. There is a slight preponderance of cases among males.

We see the greatest number of cases between the ages of ten and fifteen. It occurs very seldom after twenty. If it develops after thirty-five, it is not idiopathic, but is usually due to syphilis, alcoholism, plumbism, or injury.

Symptoms.—GRAND MAL.—A patient may feel premonitory symptoms for some days, such as general malaise, irritability, or giddiness. In about half the cases the attack begins with a peculiar sensation called the aura, which gives a warning to the patient that an attack is impending. There are different forms of auræ, the sensory being the most common. A sensation as of a mist is felt in some part of the body, mounting toward the head. There are *ocular auræ,* such as flashes of light or color, strange forms, double vision, or blindness; *auditory auræ,* such as strange voices or sounds; *olfactory auræ,* such as a sensation of a disagreeable odor; and *psychical auræ,* such as alarm, terror, or a strange dreamy sensation. Forced movements may precede an attack, such as moving forward rapidly, "procursive epilepsy," or rapidly turning around as on a pivot. Just preceding the attack, which is abrupt, the patient usually utters a wild cry, scream, or groan and falls to the ground unconscious. We may divide the convulsions into three stages:

1. *Tonic Spasm.*—The face is pale; the head, eyes, and mouth are drawn back and rotated to one side. The whole body is in a state of rigidity. The hands are clenched, the arms and forearms flexed, the legs extended, and the feet extended and inverted. The distortion of the body is not always the same. There is a respiratory spasm also, which makes the face dusky or livid. This stage lasts from a few seconds to one or two minutes, and merges into the second.

2. *Clonic Stage.*—There are tremulous vibrations, which increase until the limbs are jerked and violently tossed about. The face muscles in the clonic spasm cause frightful contortions. The eyes roll; the eyelids are opened and closed; the pupils are immovably dilated, but oscillate after the attack. Foamy saliva is forced from the mouth, and the tongue is likely to be bitten. The respirations are noisy and stertorous. Urine and fæces may be passed involuntarily, especially in the night attacks. The temperature is usually normal, but there may be a slight rise. This stage rarely lasts more than one or two minutes, and the patient passes into the third stage.

3. *Stage of Coma.*—A deep sleep, with or without noisy breathing. After a few minutes or hours, the patient wakes with a headache or mental confusion and muscular soreness.

STATUS EPILEPTICUS.—The attacks may follow one another in rapid succession, without the patient's regaining consciousness. The pulse, respiration, and temperature rise, and the condition becomes serious. Death may ensue from exhaustion.

POSTEPILEPTIC SYMPTOMS.—After emerging from the coma, the patient may appear as in a trance and move about performing senseless and purposeless actions, although he seems perfectly conscious. This condition of epileptic automatism may pass into epileptic mania, in which condition the patient is dangerous to those about him. A slight and transient hemiplegia or aphasia may be noticed after an attack. Mental impairment and ultimate dementia may be the result of attacks of epilepsy.

Nocturnal Epilepsy.—People may have attacks of epilepsy in their sleep, and at no other time, so that the condition may exist for years without the patient or his friends knowing it.

Petit Mal.—There is a sudden loss of consciousness, so that the patient stops what he is doing, his face becomes pale and fixed, and his pupils dilate. In a few seconds he regains consciousness and continues what he was doing as if nothing had happened. Auræ seldom occur in this form, but if they do, they usually consist in forced movements.

Psychical Epilepsy.—The patient may perform some peculiar automatic action, such as undressing himself, tearing anything within reach, rubbing his face and beard, or spitting about in a careless way. Sudden outbursts of maniacal excitement may take place, and during these ("masked epilepsy"), crimes and particularly assaults may be committed. There are many different manifestations of petit mal.

An attack may terminate in facial twitchings or sudden jerkings in the limbs, sudden tremor, or sudden visual sensations. In the majority of cases grand mal ultimately develops. The two forms may alternate.

Jacksonian Epilepsy.—This form is caused by some irritation of the motor centres, especially of the cortex of the brain. Consciousness is not lost in these attacks, or only very late in the attack. The spasm begins in a group of muscles, and extends until the whole limb or face is involved. There may be premonitory numbness and tingling. The extent of the brain lesion may increase, making the convulsions involve more muscles. The convulsions may become general.

Diagnosis.—Petit mal is simulated by syncope, Ménière's disease, cardiac lesions, and indigestion. In these there is no actual loss of consciousness, which we usually see in petit mal. Grand mal is simulated by the convulsions from uræmia, simple convulsions in children, convulsions from organic brain diseases, malingering, and hysteria. In uræmia there is scanty, albuminous urine with high arterial tension. Convulsions in children can usually be traced to some readily recognized cause. In organic brain disease (tumors, paresis) the history and other symptoms usually serve to distinguish them. Malingerers do not bite their tongues and do not foam at the mouth, and the attack can be stopped by strong pressure over the supraorbital notches. Gowers has formulated the following table to distinguish epilepsy from hysteria, which may closely resemble it.

	Epilepsy	*Hysteria*
Apparent Cause.	None.	Emotion.
Warning.	Any, but especially unilateral or epigastric auræ.	Palpitation, malaise, choking sensation.
Onset.	Always sudden.	Often gradual.
Scream.	At onset.	During course.
Convulsion.	Rigidity followed by "jerking," rarely rigidity alone.	Rigidity or "struggling," throwing about of limbs or head, arching of back.
Biting.	Tongue.	Lips, hands, or other people or things.

	Epilepsy	*Hysteria*
Micturition.	Frequent.	Never.
Defæcation.	Occasional.	Never.
Talking.	Never.	Frequent.
Duration.	A few minutes.	More than ten minutes, often much longer.
Restraint necessary.	To prevent accident.	To control violence.
Termination.	Spontaneous.	Spontaneous or induced (by water, etc.).

Prognosis.— Except in Jacksonian epilepsy and in certain forms of reflex epilepsy, the prognosis is not good, although treatment will give considerable relief. It does not tend to markedly shorten life. In a large number of cases the mental faculties are considerably impaired, but many epileptics lead an active, useful life. Where the convulsions develop in adults, particularly when they are caused by syphilis, and in children in acute fevers, the prognosis is better.

Treatment.—In Jacksonian epilepsy we may be able to remove the cause, as by antisyphilitic treatment or by surgical means. If rickets, eye strain, ear irritation, or digestive disturbance exists, treat it. If there is an irritation from a long and tight prepuce, perform circumcision. However, even with the removal of the cause, where the condition has existed for some time, the results are imperfect, for there seems to be a habit of nerve discharge established.

Where the aura is slow, we may be able to check the spasm by inhalations of nitrite of amyl. If there is an ascending sensory aura, we may abort the spasm by tightly encircling the part with the hands or a tight bandage. Usually, however, the auræ are too short to allow of any preventive measures.

During the attack we should have the patient on his back, with the clothes loosened and something placed between the teeth, such as a handkerchief, to prevent the tongue from being bitten. If the convulsions are severe, we may administer a little chloroform by inhalation or morphine subcutaneously.

GENERAL TREATMENT.—In the case of children the parents should understand that the disease is incurable, but that much can be done by proper management. The children need firm, but kind treatment. If caprices and whims are indulged, moral control, which is so necessary in these cases, is weakened. As most patients are not incapacitated for occupation, they should be educated and have some definite pursuit. Should the mental impairment become marked, and the patient become extremely irritable or violent, it is better to place him in an institution under competent supervision. An outdoor life with exercise, hygiene, and proper diet has a very great influence for good. Marriage should be interdicted.

It is better to order a diet mainly vegetable, although meat may be permitted once a day. Regularity in meals is important, and overloading of the stomach should be prevented.

Medicinal Treatment.—Bromides seem to have a special influence. The mixed bromides and bromomangan give the best results. The drug must be well diluted in water or milk, and should be administered up to the production of mild bromism, shown by drowsiness, mental depression, a foul breath, and muscular weakness, and then the dose reduced until the patient is kept just within its physiological action, known by the loss of the palate reflex. By diluting the medicine with alkaline waters, and also giving arsenic, the tendency to acne is diminished. From ʒss. to ʒij of the bromides a day is usually a sufficient dose for an adult, and we should strive to give a full dose some time, from four to six hours, before an attack is likely to occur. The bromide treatment should be continued for two or three years after the cessation of the attacks. Some patients do not stand the bromides well, and we must depend on other drugs, but principally upon outdoor exercise, hygiene, and proper diet.

Other drugs have been recommended. Antipyrine with the bromide is of value. A combination of bromide of ammonium, gr. xx to xxx, antipyrine, gr. vij, and Fowler's solution, mij to iij, twice daily, is recommended. Sulphonal may be administered with the bromide, also chloral and cannabis indica.

SLEEPING SICKNESS; NEGRO LETHARGY; TRYPANOSOMIASIS

This is an endemic disease of western Equatorial Africa characterized by drowsiness, mental and physical lethargy, and muscular debility. It generally proves fatal after a period of months or years.

Ætiology.—Quite recent investigations by an English commission seem to indicate that the disease is caused by a variety of trypanosoma in the cerebrospinal fluid and blood. It is possible that there is another concomitant factor, particularly in the later stages of the disease. From the distribution of the tsetze fly, "the inference that that insect carries the trypanosoma is almost unavoidable."

Symptoms.—Prodromal.—Increasing drowsiness and muscular feebleness. This period may last for from some months to one or two years.

Declared.—Pronounced somnolence, intense muscular prostration, and at times tremor. In this stage the patient is unable to walk and eats only when food is brought to him.

Final.—Spasmodic contractions of muscular groups, paralysis, bedsores, wasting, often convulsions and coma. Mania may supervene at any stage. There is a great difference in the variety and intensity of the symptoms.

Treatment.—In the light of the recent investigations, it would seem possible to prevent the disease. If the natives could be protected from the tsetze fly, probably no cases would occur. Until now, the treatment has been symptomatic. Arsenic has seemed to be of benefit in some cases.

DERANGEMENTS WITH PSYCHICAL ALTERATIONS PREDOMINATING

GENERAL REMARKS

Functional nervous derangements make up the bulk of medical practice, and they can usually be benefited and cured. In the activity of the age, the ambition for fame, money, and pleasure has become so contagious that many people are led to extremes of every sort. Rules of hygiene are utterly disregarded, and overworked nerves will manifest themselves sooner or later.

The natural credulity of man, the mental condition resulting from overfatigue and unaccomplished or defeated ambitions, the peculiar innate desire of man to attain the unattainable, make him a prey to those people who, clever enough to recognize these facts, establish cults and societies, disguised under Christian titles, as pseudooccult mysticism. Neurotic people are led to disregard their nervous or psychical ailment in their enthusiasm over the "new thought," and receive a suggestion that they are happy and are not ill, which benefits or cures them.

The physician should recognize such cases, and should treat them, as they need to be treated, by *mental suggestion*. We may call it "hypnotism," "mental cure," or by any truthful name, and it is much better for the intelligent, educated physician to keep these patients than to let them fall into the hands of the clever but unscientific, uneducated and dishonest leaders of cults.

NEURASTHENIA

Neurasthenia is a functional disorder of the entire nervous system dependent upon malnutrition and characterized by nervous weakness and irritability. Nervous prostration, nerve tire, nervous exhaustion are synonyms. *Hypochondriacs* is a term applied to those neurasthenics who are uneasy in regard to their health and depressed in spirits.

Ætiology.—Nature demands a balance between the storing and expenditure of energy. If this demand is disregarded, exhaustion results. Some one has said that the cells of the body demand twice as much rest as work.

Forms.—We speak of primary and secondary forms.

1. PRIMARY NEURASTHENIA, or that caused by excessive expenditure of nervous energy. Underlying this there may be an hereditarily weak nervous system; feeble health during childhood, which favors a poor nervous system; vicious early education and training; exhaustion from the effort to excel or even to exist; anxiety, worry, mental depression, and fear; overwork, mental or physical; sexual overindulgence; and overstudy. Doubtless in young children who are pushed beyond their capacity by overambitious parents or tutors neurasthenia may exist with favorable hygienic surroundings, but the great majority of cases are due to unsystematic, unscientific, and poor methods in the acquisition of knowledge. The mind of a student who is perfectly well physically, of one who exercises out of doors, who sleeps well and sufficiently, who has plenty of suitable food, and who has sufficient diversion, is very unlikely to be overworked, but rather to remain in a healthy condition. A student should have a healthy body, should learn to be methodical and regular in his habits, learn to concentrate his mind and study with good methods, and allow sufficient time for exercise, sleep, and diversion.

2. SECONDARY NEURASTHENIA is due to a deficient supply of nervous energy. Leading to this are diseases of all kinds of an organic nature, which weaken the nervous system; autoinfection as a result of indigestion; constitutional diathesis, including gout and rheumatism; infectious diseases,

such as typhoid fever, grippe, and malarial disease; and poisons, including alcohol, tobacco, and drugs, such as morphine, cocaine, and chloral.

Symptoms.—CEREBRAL —There is headache, which may be occipital or frontal, and dull in character, with vertigo, insomnia, sensitiveness of the scalp, and peculiar sensations, such as fulness, pulsation, and the feeling as if a band were about the head. *Mental* capacity to work is impaired; the memory is poor; concentration is difficult; the patient is irritable; there are prominent peculiarities of disposition; the patient has morbid fears of people and places, is anxious and apprehensive; and the respiration is imperfect and the pulse rapid.

SPINAL.—There is actual pain, especially in the back of the neck and in the sacrum; there is a sensitiveness about the ribs and along the intercostal nerves; different parts of the body may feel supersensitive or irritated; the legs do not seem strong enough to hold one up. Sexual irritations are common; there may be erections, emissions, impaired power, or irritability of the bladder or urethra, with frequent urination.

VASOMOTOR SYMPTOMS.—There are hot and cold sensations, cold feet and hands, sweating, transitory blueness or swelling, the tâche cérébrale of Trousseau, tachycardia, and palpitation of the heart.

GASTROINTESTINAL SYMPTOMS.—Indigestion and dyspepsia occur, particularly the form known as hyperacidity, and there may be constipation, flatulence, or pseudomembranous colitis.

SENSORY AND MOTOR SYMPTOMS.—There are indefinite pains and paræsthesiæ, joint affections, apparent paralysis, but with no change in the electrical reactions, and imperfect vision, asthenopia. The visual field may be contracted. Sometimes other senses may be affected, as with tinnitus aurium.

It is seldom that we see all these symptoms in one patient. Many times some one or some group is very pronounced, and the others are not present. They change from day to day.

Diagnosis.—If we can find a cause for nervous exhaustion other than organic disease, we may, by "sizing up" the patient, by noting the variability of the symptoms and the disproportion between the complaint and the actual trouble, pronounce the trouble neurasthenia. The physician should be very careful to exclude organic disease.

Treatment.—PREVENTIVE.—Try to teach patients how to live. Kant's rule, eight hours for work, eight for diversion, and eight for sleep, is a very good one to follow if you have money. See that the children are being educated and trained properly.

The treatment of the disease is very unsatisfactory, for it takes a long time to reestablish the nerve energy. Rest, proper food, exercise, hydrotherapy (cold douches), and diversion should be resorted to. The treatment should be very systematic and very varied, to keep the patient interested, contented, and yet free from fatigue.

Drugs may be used when necessary to meet the symptoms. Tonics, sedatives, and electricity are indicated. The glycerophosphates seem the best modern drugs for nervous fatigue. The use of cacodylate of sodium subcutaneously has given good results. Vibratory massage is excellent. Static electricity and the high frequency current are popular.

HYSTERIA; HYSTEROEPILEPSY

"A functional disturbance of the nervous system, characterized by mental and moral perversion, lack of self-control, and disorders of any or all of the bodily functions."

Ætiology.—It is a product of modern civilization, and is more prevalent in women than in men. It may appear at any age, but is most common between the ages of fifteen and twenty-five. *Hereditary influence* is considerable, as in many cases there is a family history of nervous troubles. Improper early training is largely at the root of it, creating a lack of moral responsibility and self-control. Directly, the emotions—fear, anxiety, jealousy—unhappy love affairs, domestic worries, sexual excess, masturbation, physical conditions, such as indigestion, bad habits, injuries, and accidents, especially those attended with fear, and anæmia causing malnutrition of the nervous system and ovarian or uterine disease, may cause hysterical conditions.

Pathology.—The disease is looked upon as purely functional, and no organic lesion is present.

Symptoms.--As there is no known disease or morbid objective symptom which cannot be imitated by an hysterical patient, it is readily seen that its manifestations are legion. A brief classification of its most prevalent forms will be given.

MOTOR SYMPTOMS.—*Convulsions.*—These may be mild, appearing after some emotional excitement. The patient laughs and cries alternately, feels a "ball" in her throat (globus hystericus), and has painful or peculiar sensations resembling an aura. Then comes the convulsion, which subsides gradually, usually with the passage of flatus or of a large amount of limpid urine. A more severe form, classed as *hysteroepilepsy*, may be marked by excessive convulsive motions and subsequent emotional display, such as *cataleptic poses*, opisthotonus, delirium, and hallucinations (see article on Epilepsy for differentiation).

Paralyses.—Any part of the motor apparatus may be affected, but paraplegia is the most common form. Aphonia is frequent. There are usually some other symptoms of hysteria combined with the paralysis.

Contractures may affect any joint. They disappear during sleep or *chloroform narcosis*. *Spasms* are not uncommon.

SENSORY SYMPTOMS.—There may be irregular areas of anæsthesia and hyperæsthesia. Hysterical hemianæsthesia is common. Hyperæsthesia to the extent of pain in the head, of an agonizing character, like that of a nail being driven into the skull, called hence "clavus hystericus," is not infrequent. The spine, abdomen, and breast are regions for hyperæsthesia.

Special Senses.—Lessening of the visual field, hemianopia, blindness, or change in the perception of colors is seen. Loss of the senses of taste, smell, and hearing is common.

DIGESTIVE SYMPTOMS.—"Globus hystericus," spasm of the pharynx and œsophagus, vomiting, anorexia, a depraved appetite, gastric pain, reversed peristalsis, flatulence, diarrhœa, and constipation may be hysterical.

RESPIRATORY SYMPTOMS.—Rapid breathing, dyspnœa, extraordinary cries and sounds, a dry paroxysmal, barking cough, and spurious hæmoptysis may be seen. The blood is of a pale red color and comes from the mouth or pharynx, unless deception is practised, for which we must always be on the lookout.

CIRCULATORY SYMPTOMS.—Irritability of the heart, rapid pulse, pain over the heart (pseudoangina pectoris), hot flashes and cold chills, pallor, flushings (general or localized), circumscribed œdema, and hæmorrhages in the skin are seen. These latter are usually fraudulent in origin.

URINARY SYMPTOMS.—After an hysterical attack the urine is abundant, watery, and of low specific gravity. Retention is common, but incontinence is unknown, which is a diagnostic point between hysteria and true epilepsy. Partial or complete anuria may be seen, and during this period the sweat, vomit, and other discharges become loaded with urea. Uræmic convulsions never occur in cases of pure hysteria. Bladder and urethral irritation, with frequent micturition, is common.

JOINT SYMPTOMS.—Following slight injuries, or without injury, one of the larger joints, such as the knee or hip, becomes swollen and flexed and resists passive motion (Brodie's joint). However, changes in its position may be observed. The skin over the joint may be hyperæsthetic; it is usually cool, but at night may be hot and painful. Sometimes, if the condition lasts long enough, there may be wasting of the muscles and organic changes in the joint.

TEMPERATURE.—This is usually normal. Rarely an elevation to from 102° to 103° is observed, and exceptionally a rise to 108° to 110° has been recorded. These high temperatures are probably in some way produced fraudulently. Fever with symptoms of peritonitis is occasionally seen. Meningitis also may be simulated.

MENTAL SYMPTOMS.—Moral perversion, increased irritability, emotional exaggerations, impaired self-control, and craving for notice and sympathy are manifested. This leads to self-injury, as by swallowing needles, sucking blood and vomiting it, and inflicting sores which are not allowed to heal. There may be purposeless criminal acts, such as setting fire to houses and stealing. Depression is common, occasionally hallucinations may occur, and melancholia may be feared. Trance and catalepsy may develop. A patient generally has more than one of the many symptoms, and may have many.

Trance is an hysterical condition, developing spontaneously or after some hysterical attack, in which all animation is apparently suspended.

Catalepsy is an hysterical or hypnotic condition (see article on Hypnotism) in which the limbs remain in any position in which they are placed for a greater or less length of time.

Diagnosis.—The diagnosis is made from a study of the general condition, and not from a single symptom.

Prognosis.—The prognosis as to life is very good. The duration depends upon the severity of the symptoms and the environment and moral force of the patient.

Treatment.—The physician should make a most careful examination of his patient, and exclude organic disease. He should obtain the confidence of his patient and let her know that he understands the case. The suffering is real, but the patient should not receive too much sympathy, as it is necessary to exert self-control as much as possible. Educate the morals and try to give mental change. If the home and surroundings are at the bottom of the trouble, send the patient away and furnish her with cheerful diversion. Hydrotherapy, electrotherapy, massage, the rest cure, and mental therapeutics may be combined with tonics, such as strychnine, iron, and quinine. Treat the symptoms, but never give opium in any form.

THE TRAUMATIC NEUROSES; TRAUMATIC HYSTERIA

Traumatic neuroses are morbid conditions which originate with a shock and show symptoms of neurasthenia, or hysteria, or both. The name was given because the condition was supposed to be due to an inflammation of the meninges or the spinal cord.

Ætiology.—Although cases develop after an accident, often in a railway train, where there is a bodily shock or concussion, the neurosis may arise without the shock or concussion. The patient may simply know that there has been an accident to the train on which he is riding, or may have seen some terrible accident which has sufficed to bring on the symptoms. A week may elapse after the accident before the symptoms develop, the patient having been perfectly well during this time (railway spine).

Symptoms.—SIMPLE TRAUMATIC NEURASTHENIA.—Usually the symptoms develop some days or weeks after the accident, which may have done no bodily harm. Headache, insomnia, loss of concentration, irritability, despondency, and, in extreme cases, melancholia may develop. In fact, all the symptoms of neurasthenia may be present, and according to the prevalence of spinal or cerebral symptoms, the name of railway spine or railway brain is given.

CASES WITH MARKED HYSTERICAL FEATURES.—In addition to the neurasthenic symptoms, there are cases in which the emotions play an important part. Self-control is impaired. A striking feature of these cases may be a violent bodily tremor. Hemianæsthesia, achromatopsia, and limitation of the field of vision are among the more frequent hysterical signs.

CASES IN WHICH THE SYMPTOMS SUGGEST ORGANIC DISEASE OF THE BRAIN OR SPINAL CORD.—There may be no fracture or external lesion, and yet some time after the injury or shock there may rapidly develop symptoms suggesting organic disease. Sensory and motor disturbances are the most common, but it is very difficult to distinguish hysteria from real injury. "The symptoms upon which the greatest reliance can be placed as indicating organic change are optic atrophy, bladder symptoms, particularly in combination with tremor, paresis, and exaggerated reflexes." Autopsies in cases where death follows spinal concussion in a few days may show nothing abnormal. In a few instances punctiform hæmorrhages have been found in the brain and spinal cord. In a few cases where death has resulted a considerable time after the accident, and the symptoms have been those of neurasthenia and hysteria, there have been found sclerotic and softened areas in the cord and brain.

Diagnosis.—It is very difficult to detect a simulator from one who is really suffering from a trauma. Under usual conditions, pressure upon a really painful spot will increase the pulse rate; if the pain is simulated, the pulse rate does not increase. Optic atrophy, bladder trouble, and signs of sclerosis of the cord, indicating a degeneration of the lateral columns or multiple sclerosis, point toward organic disease.

Prognosis.—"Traumatic hysteria is one of the most intractable affections which we are called upon to treat, but most cases recover."

The **treatment** is that of neurasthenia and hysteria. Suggestion has probably given the best results.

INSOMNIA

Sleeplessness is one of the most frequent conditions which physicians in large cities are called upon to treat. We should aim to discover the cause and remove it.

We may class the causes as follows:

Pain, as with excessive headaches.

Poisons circulating in the blood, as in acute infections, Bright's disease, hepatic disease, and intestinal toxæmia.

Insanity, as in melancholia, mania, paranoia, and paresis.

Ordinary types, seen in nervous people and neurasthenics.

These cases may be divided into:

Those with *cerebral congestion*.

Those with *cerebral anæmia*.

Treatment.—INSOMNIA DUE TO CEREBRAL CONGESTION.—This form is recognized by distress and a feeling of distention in the head, muscular irritability, and overexcitability. We may endeavor to remove the congestion in the brain by various means. An enema or laxative may be given in the morning.

There are various forms of hydrotherapy to be tried always before drugs. These are to be used just before the patient goes to bed.

A *hot bath* sometimes succeeds in causing sleep, but contraction of vessels is likely to follow soon, and again cause congestion. A cold sponge bath after the hot bath seems to prevent this. A good plan is to have the patient stand in tepid water which reaches above the ankles, and then wrap around the body a dripping sheet from a pail of cold water, at about 80°, rubbing the body at the same time. Other resources are the *cold pack to the abdomen* and wearing a flannel cloth wrung out of water at about 75°, covered with a dry towel and then with a rubber cloth. The cold flannel soon becomes warm, and acts as a poultice, bringing blood to the abdominal cavity.

Exercise.—Five or ten minutes of calisthenics or exercising with dumb bells or Indian clubs before going to bed serve a good purpose, also a brisk walk outdoors before going to bed. Forcible respiratory movements, with deep inhalations of fresh air, at bedtime are also helpful.

Drugs.—Bromides are best for cerebral congestion. Give gr. xx to xxv about half an hour before the patient goes to bed. A mixture of two or three of the bromides, such as bromide of sodium, potassium, ammonium, and strontium, seems better than one alone. Chloral hydrate and bromides may be combined. *Sulphonal* and *trional* should be given with food—sulphonal about one hour before bedtime, and trional fifteen to twenty minutes before, gr. x to xx, also urethane, ʒ½, and codeine, gr. ½, may be taken together at bedtime, or hyoscine, gr. $\frac{1}{100}$.

Suggestion is of great benefit. Autosuggestion, or the suggestion of the physician, with a sugar tablet, or a hypodermic injection of sterile water, is effective at times.

INSOMNIA DUE TO CEREBRAL ANÆMIA.—Patients with this form of insomnia usually sleep well at first, but wake up and cannot go to sleep again. Stimulation is indicated in these cases and the bowels should move regularly.

Beer, whiskey, or gr. $\frac{1}{60}$ of strychnine at bedtime does well. Chloral and chloralamide are good hypnotics in these cases. When a person wakes, and cannot fall asleep again, advise him to get up and eat something light, or to take a little whiskey, to walk around, or to apply hot and cold water to the back. Inhalations of the fumes of whiskey or wine, or of ether, alcohol, and cologne, equal parts, on a handkerchief before going to bed may help in this class of cases. Opium, as a last resort, is indispensable in the insanities.

HYPNOTISM, OR SUGGESTION; TRANCE

Hypnotism may be defined as an abnormal mental insensibility to most of the sense impressions and excessive sensibility to some impressions. There is a certain amount of unconsciousness and an obedience to the suggestion of the one who has induced the condition. "It may be regarded as an artificial catalepsy."

The power which one person has over himself and over another, to make himself or another do or believe a thing, is a form of hypnotism or suggestion. When the physician enters a sick room, sympathetic and in a cheerful mood, he knows his power of making his patient comfortable by assurances of an improved condition and by removing from the mind unhappy and sad thoughts. This is a form of hypnotism or suggestion.

Many people are using this power of suggestion, consciously and unconsciously, and have been for centuries. Parents, teachers, ministers, employers, and physicians are constantly using suggestion, but few of them could define it or few use it scientifically. It does not take a pathological mind or a pathological nervous condition to receive suggestion. Charlatans have done an infinite amount of harm through a knowledge of this power.

As we look back over centuries of history of all countries, we may, understanding the power of suggestion, appreciate the many sects, cults, and societies which have had their origin in some minds conscious of this power. The present time is replete with examples. A number of scientific men have investigated the subject and have learned a great deal. But there is still much that we do not understand.

Hypnotism with partial or complete suppression of consciousness is the condition which we usually understand by the word. Bernheim says that the majority of people of both sexes and of all ages and temperaments can be put into the hypnotic condition. Others maintain that only hysterical people and people whose nervous system is not in a proper equilibrium can be hypnotized. Bernheim maintains that the profound sleep which may be induced by suggestion is not a pathological condition or a neurosis analogous to hysteria.

There are different methods of inducing the hypnotic condition. One is to have the patient fix his eyes on a bright object, in a manner to tire the eye muscles, and, on the operator's suggesting sleep, the patient closes his eyes from fatigue, and soon is asleep, or in the hypnotic condition. Bernheim's method is to assure his patients that there is nothing occult or mysterious in hypnotism, that it is not harmful or unnatural to produce this sleep, and, in order to reassure his patient, he hypnotizes one or two patients in his presence. After assuring him and making him believe that he can be cured or benefited by such procedures, he gains his cooperation and assistance, and puts him to sleep, by merely talking to him in a monotonous, sleepy manner, sometimes with the assistance of passes before the face and having him fix his gaze on an object, with the purpose of tiring the eyes.

There are various degrees of intensity of the hypnotic condition. There is comprised in these degrees phenomena extending from a simple numbness in the simplest forms up to entire unconsciousness of what has transpired during the hypnotic condition, catalepsy, automatic movements, contractures, hypnotic hallucinations, and posthypnotic suggestions.

The **clinical symptoms** which can be cured are mainly neurotic and hysterical, but in the larger cities we see such a number of such cases that the value of hypnotic suggestion is apparent. The marvelous sudden cures of paralyses and other conditions, as at Lourdes and by those so called "healers," are probably all hysterical conditions and the healing power is suggestion.

CLASSIFICATION OF MENTAL DISTURBANCES, AFTER KRAEPELIN AND MEYNERT

a. Acquired mental disturbances.

Acute and chronic conditions of *collapse with delirium.*
Acute *amentia* and *dementia.*
Acute and chronic intoxications.
Fever delirium, }
Poison delirium, } Acute forms of delirium.
Alcoholism, }
Morphinism, } Chronic forms of delirium.
Cocainism, }
Metabolic disturbances with insanity, as in myxœdema, cretinism, dementia paralytica.
Insanity with cerebral disease.
Syphilitic dementia.
Paretic dementia.
Senile dementia.
Alcoholic dementia.

b. Psychical degeneration in weak brain or maldeveloped brain.

Periodical psychoneuroses, confusional, emotional, impulsive, depressive (melancholic) forms, with imperative ideas or sexual perversions.
Maniacal forms—dementia præcox.
Paranoia.
Epileptic insanity.
Imbecility, idiocy.

VASOMOTOR AND TROPHIC DISTURBANCES

GENERAL REMARKS

The nutrition of a part is governed by the nervous system. A disturbance of this part of the nervous system results in disorders designated as trophic disturbances or trophic neuroses. Hypertrophy or atrophy of nerves, muscles, and cutaneous and mucous tissues, joint degeneration, and various skin eruptions are examples of trophic neuroses. If joints are affected, we speak of *arthropathies;* if muscles, *atrophies, hypertrophies*, and *dystrophies;* if nerves, *degeneration;* if fat is substituted for atrophy, or associated with atrophy, we call it lipomatosis or fatty degeneration, as in some dystrophies. Herpes, pemphigus, and other eruptions, pigmentation, leucoderma, non-parasitic alopecia, and bedsores are examples of trophoneuroses of the skin.

The nerves which supply the blood vessels and the glands may be affected, and produce a variety of symptoms. Vessels and glands may be affected separately, but usually both are affected by the same neurosis.

Angeioneurosis designates a disorder of the vasomotor centre and nerves. *Angeiospasm* is applied to the condition where there is a spasmodic contraction of the muscular coats of the arteries with an increase in the vasomotor tone. *Angeioparalysis* represents an opposite condition. Pallor and coolness, and flushing, and heat are the results of such conditions of spasm and paralysis.

Secretory Neuroses.—The skin is the part of the body which most often shows this disturbance.

Hyperidrosis is an excessive sweating. *Anidrosis* is an excessive dryness. *Paridrosis* is a perversion of the perspiratory secretion. We may notice peculiar odors and colors to the perspiration. *Hæmidrosis* is bloody sweating.

RAYNAUD'S DISEASE

This is a rare disorder, probably due to a vasomotor disturbance.

Ætiology.—It occurs most often in children and young women. Anæmia, chlorosis, and neurasthenic conditions seem to create a predisposition. Malarial infection, acute infectious fevers, menstrual disorders, fright, and occupations that lead to exposure, such as washing, seem to be exciting causes. Diabetes and syphilis are underlying causes. The disease comes on rather suddenly and affects most often two or three fingers of both hands. There are three grades of intensity:

1. LOCAL SYNCOPE is the most common form. There are coldness and pallor of the extremities (called "dead fingers" or "dead toes") which can be induced by cold or emotions. The affected parts are stiff and sometimes painful. There is a waxy pallor; the skin looks shrunken, and there is slight anæsthesia. After a few hours this passes away but returns again and may become almost a constant condition.

2. LOCAL ASPHYXIA may succeed these conditions, or the disease may appear first in this manner. The affected parts, fingers, toes, ears, and nose, become livid and cyanosed. There are numbness, swelling, and some pain. The capillary circulation is exceedingly sluggish. Upon the attack wearing

off, the parts become bright red from the overactive circulation. Local gangrene may follow severe attacks. Recurrences are common, especially during cold weather. There may be much pain in this stage, but no anæsthesia. Gangrene may follow.

3. Local or Symmetrical Gangrene.—Spots of ecchymosis and vesicles appear, and at these points a symmetrical gangrene develops. The ears, fingers, and toes are the usual situations. Usually the part becoming gangrenous is small, and when it heals it leaves a scar. Rarely the whole tip of the finger or toe may be involved and separated. Purpura hæmorrhagica, intermittent hæmoglobinuria, peripheral neuritis, and a variety of mental and cerebral symptoms may complicate the disease. The gangrenous stage lasts about three weeks.

Differential Diagnosis.—We have to distinguish from frostbite, senile gangrene, ergot poisoning, alcoholic neuritis, endarteritis, and obstruction of the nutrient vessels.

The **prognosis** is good except where there is extensive gangrene and in the gangrenous cases complicated by purpura hæmorrhagica, etc.

Treatment.—Avoid exposure to extreme cold. If possible, spend the winters in a warm climate. Galvanism to the spine and limbs, warm applications, anodynes, and tonics are indicated. Internal medication seems to do no good, but we may try nitroglycerine, the iodides, and chloral.

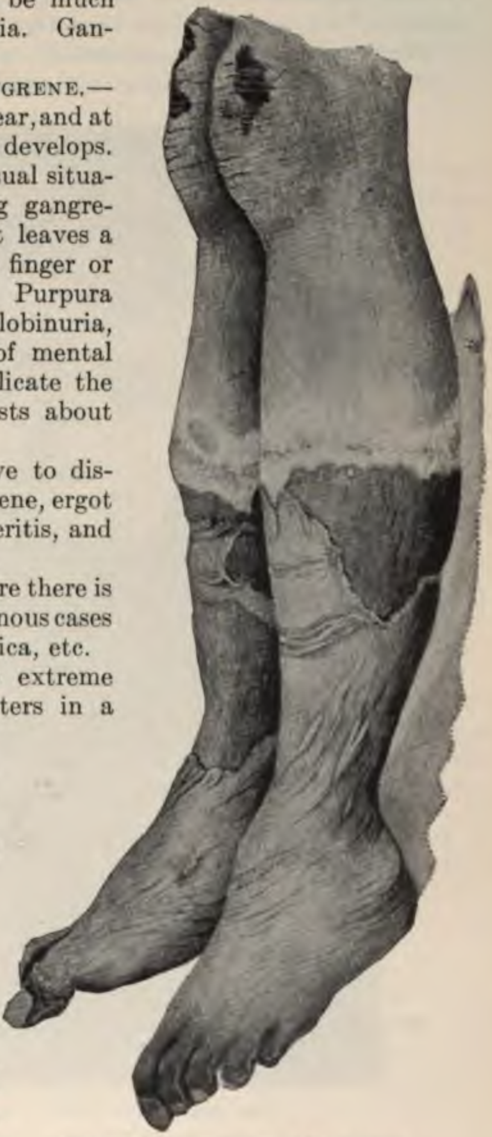


Fig. 213.—Symmetrical Gangrene.
Raynaud's Disease or Endarteritis Obliterans.
(J. D. Morgan.)

ERYTHROMELALGIA

Erythromelalgia is a very rare chronic disease characterized by severe pain, flushing, and local heat, usually in one or more extremities. The pain is intensified if the part hangs down. It affects the feet chiefly. It occurs usually in men of middle life after a low fever or severe physical exertion on the feet.

The disease develops gradually from dull pain, worse at night, in the ball of the foot to an almost continuous pain of the whole region supplied by the plantar nerve. The affected part later assumes a dull, dusky, mottled redness. The congestion and pain usually disappear when the part is in a horizontal position. Although the disease is not necessarily fatal, it makes life miserable.

The **diagnosis** is to be made from alcoholic and gouty paræsthesiæ, podalgia, local diseases of the bone and ligaments, and reflex pains.

Treatment is very unsatisfactory as to cure Temporary relief is obtained by elevation of the feet and applications of cold. Faradization has helped in some cases. Rest, bandaging, cold, anodyne applications, hydrotherapy, and tonics may be tried.

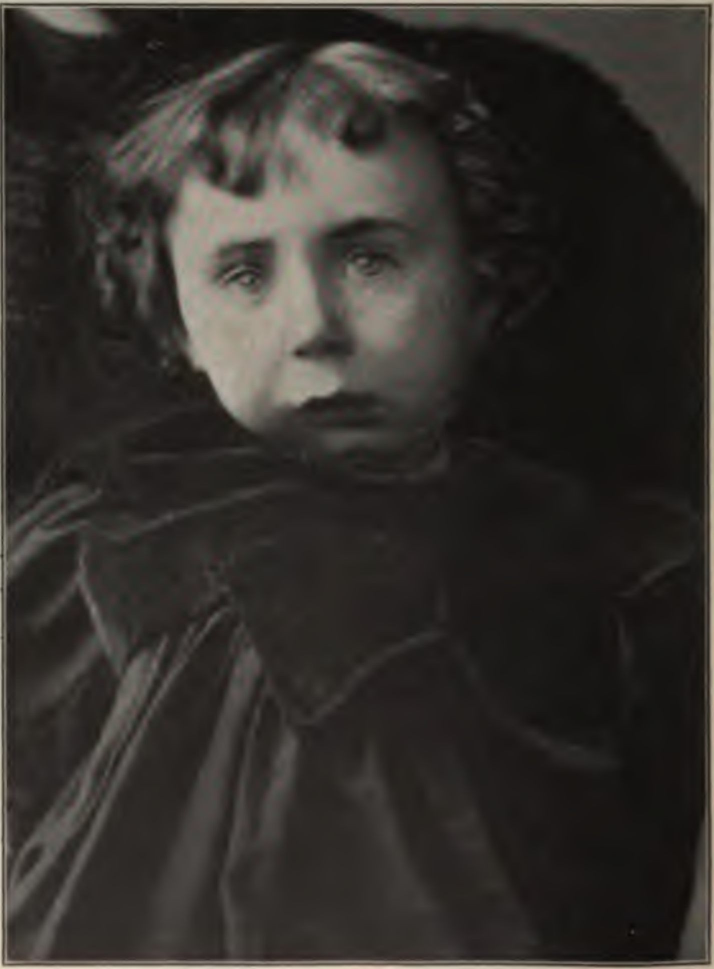


Fig. 214.—Hemiatrophia Facialis Progressiva.
Archives of Pediatrics, 1899. (Dr. F. Huber.)

FACIAL HEMIATROPHY

Facial hemiatrophy is a rare condition, often congenital, usually beginning in childhood, and characterized by atrophy of one half of the face.

The **pathology** is not known.

Symptoms.—In childhood usually, a small area of atrophy begins on the cheek or chin and gradually spreads so as to involve one half of the face and scalp, being sharply limited at the median line. Although the change in the muscles is slight, the bones and other deeper structures share in the atrophy. Pains and peculiar sensations may be present at first. The tongue and palate may show atrophy on one side. The left side of the face is most often involved.

Prognosis.—Recovery has never been seen, but the disease is not serious as to life. It progresses slowly, but the process may be arrested at any time.

Treatment.—Although it is incurable, tonics and operations upon the fifth nerve have been tried.

Other trophoneurotic manifestations are *angeioneurotic œdema* (see Œdema), *acromegaly* (see Disease of the Ductless Glands), *mal perforans*, perforating ulcer (see Locomotor Ataxia), *trophic diseases of the extremities and joints* (see Joints), *herpes* and *scleroderma* (see Dermatological Memoranda).

MENINGITIS IN ADULTS

(For Meningitis in Children, see Pædiatrics)

GENERAL DIAGNOSTIC AND THERAPEUTIC REMARKS

The meninges respond to irritation like other serous membranes, and may become the seat of primary or secondary inflammation, accompanied by serous or purulent effusion. The same species of microbe which produces a pneumonia or pleurisy may start a meningitis or synovitis, according to its localization. The infecting agent may reach the meninges through the blood, or by extension from the nasopharynx, the ear, or the eye. Meningeal symptoms, such as delirium and slight rigidity of the neck, are often observed in acute infectious diseases. These are toxic (toxæmia) phenomena, and must not be confounded with true meningitis.

The ordinary clinical varieties are:

1. Leptomeningitis (acute and chronic).
2. Tuberculous }
3. Cerebrospinal } Meningitis.
4. Pachymeningitis (acute and chronic).

Differential Diagnosis.—In discriminating between the various forms of meningitis, it will be well if we bear in mind that all the symptoms spoken of are the usual ones of a group of pathological conditions which we class under the heading of encephalomeningitis, whose ætiology embraces a variety of causes:

1. Primary microbial infection, including the tuberculous variety. 2. Secondary microbial infection, following any form of acute or chronic infection, including syphilis and favored by alcoholism. 3. Extension of a neighboring inflammatory process of the ear or nose, panophthalmitis, intracranial abscess, tumors, etc.

Symptoms and Signs of Meningitis in General.—General malaise, drowsiness, vomiting, constipation, stiff neck and back, loss of control of the bladder and rectum, convulsions, delirium, coma, and set eyes.

The temperature ranges from 101° to 105°, 106°, 107° F., or higher. The pulse at first is rapid, then irregular and slow. Cheyne-Stokes respiration is often seen.

When we are face to face with illness in which meningeal symptoms are noticeable, the first practical and important point is to decide whether or not there is meningitis. The question cannot be decided by taking into consideration any group of symptoms. A careful weighing of all the evidence is necessary.

Vomiting, delirium, muscular rigidity, as symptoms of toxæmia, are just as pronounced in some cases of pneumonia, influenza, or eruptive fevers as in acute true cerebral or spinal meningitis. Malaise, vomiting, constipation, low muttering, grinding of the teeth in sleep, injected conjunctiva, irregularity of the pulse, and sighing respiration are symptoms of long standing intestinal inertia and autoinfection, as well as symptoms of tuberculous meningitis.

In meningitis we can generally elicit the *tâche méningitique,* or Trousseau's sign, by drawing the finger nail sharply over the skin. Owing to vasomotor disturbances the red irritation mark comes slowly and disappears slowly.

KERNIG'S SIGN.—In cases of meningitis it is usually impossible for a patient lying on his back to flex the thighs upon the body without flexing the knee at the same time, and complete extension of the legs is impossible.

Both Trousseau's and Kernig's sign are occasionally found in patients not suffering from meningitis, and their absence does not positively exclude the diagnosis of meningitis.

SPINAL PUNCTURE.—The cerebrospinal fluid obtained by puncturing the spine is cloudy or turbid in acute meningitis. In several cases of meningitis the writer has withdrawn pure pus by spinal puncture repeatedly.

In tuberculous meningitis the fluid is very clear. The tubercle bacilli can seldom be found in the fluid by microscopical examination. If present, they are detected by the culture and inoculation tests. For modus operandi of spinal puncture see chapter on Dropsy and Effusion.

Treatment of Meningitis in General.—Order an ice coil to the head, warm mustard baths, and cool sponge baths; fever diet (milk, gruels, broths, tea, beef tea, and eggs); inunctions of mercurial or Credé's ointment, ʒj twice daily; a daily enema of soap water or salt water, one ounce to one pint; catheterism of the bladder in cases of retention of urine; feeding by gavage in coma; feeding per rectum; spinal puncture to relieve pressure symptoms; stimulation p. r. n. or sedatives; and tincture of iodine to check vomiting, one drop in sweetened peppermint water every two or three hours.

LOCAL TREATMENT.—In tuberculous meningitis local treatment has been attempted by the author by injecting iodoform, potassium iodide, and sodium salicylate into the subarachnoid space without beneficial results. Cases of cerebrospinal meningitis frequently recover after the administration of salicylate of sodium and bromide of potassium internally and the use of Credé's ointment externally by inunction (twice daily). The writer is unable to state whether or not Credé's ointment has any therapeutic value.

ACUTE AND CHRONIC LEPTOMENINGITIS IN ADULTS

Acute Cerebral Leptomeningitis

Ætiology.—A germ infection is regularly at the bottom of inflammations of the pia. The more common way of infection is secondary through some purulent process of contiguous parts or from distant parts through the circulation.

1. Primary Form.—The origin is not known.

2. Direct extension may follow an inflammation or injury of the bones of the skull, dura, or orbital cavity. Middle ear disease, with necrosis of the petrous portion of the temporal bone, is the most frequent cause. An infection through the cavernous sinus, from phlebitis arising from suppuration of the orbit or cheek, may be a source. From a disease of the nose causing frontal sinus suppuration or necrosis of the cribriform plate the infection may travel to the meninges. Germs may also travel along the nerve sheaths during the course of facial erysipelas.

3. Through the arteries infection may be carried during pyæmia, from an abscess of the lung or from malignant endocarditis. The infection may take place during the infectious diseases, such as pneumonia, rheumatism, and the exanthemata, but especially during pneumonia, erysipelas, or septicæmia. Bright's disease and gout seem to favor meningeal infection, and it may be a terminal infection in these, as also in arteriosclerosis, heart disease, and the wasting diseases of children. There is a predisposition from the congestion which follows sunstroke.

Pathology.—We distinguish two forms: Cellular and exudative. Cellular meningitis shows the pia congested, dry, and lustreless, with cellular infiltration of its substance. No exudate is present. Exudative meningitis shows throughout the thickened pia, within the meshes, collections of fibrin, serum, and pus. Occasionally the exudate collects on the surface. The ventricles are likely to become inflamed and distended in children and young adults. By direct extension, there may occur inflammation of the pia mater of the spinal cord. There are likely to be different inflamed areas according to the mode of infection. With middle ear disease the process is over the temporosphenoidal lobe of one side. With pneumonia and malignant endocarditis the process is likely to be bilateral and limited to the cortex. In other cases the base of the brain alone may be involved. When the ventricles are involved, the distention from inflammatory exudation may persist for some time.

Symptoms.—Prodromal.—These are conjunctivitis, headache, irritability of temper, sleeplessness, nausea, vomiting, and general malaise. The invasion may be more sudden, with fever, headache, convulsions, delirium, and vomiting. After the disease is established we observe the symptoms of *brain irritation.* The temperature varies, with irregular remissions. The headache is continuous and severe. Restlessness and stupor are the most pronounced symptoms throughout the disease. One or the other may predominate, and they may alternate. All degrees of each are seen. Supersensitiveness, localized or general, may be severe. Tenderness and stiffness of the muscles of the neck are present if the inflammation extends down to the pia mater of the cord. Involuntary contractions of groups of muscles, especially those of the face, are often present. Sometimes there may be convulsions, unilateral or general.

The roots of the cranial nerves may be involved in the inflammatory process, and as they become affected, we observe symptoms of their irritation, such as photophobia, blindness, strabismus, painful hearing, and deafness.

Vomiting may continue, or it may not appear until later. The tongue is coated and dry in the severe cases. Usually the patient is constipated, but there may be diarrhœa and involuntary movements in the last days of fatal cases. The quantity of urine is diminished and it is likely to contain casts and albumin. The pulse is rapid with cortical irritation.

The symptoms of *brain compression* follow. These are due both to the thickening of the pia and to distention of the ventricles. There are dulness, apathy, and blunting of the special senses. Stupor and coma are more likely to be seen than restlessness. There may be paralyses now of groups of muscles, or general paralysis. The pulse is now slowed and may be irregular. The coma becomes profound, the paralysis more marked, and in the latest stages the pulse becomes rapid and feeble, while the breathing may be of the Cheyne-Stokes variety.

In children there may be the same course as in adults, but from the greater likelihood of distention of the lateral ventricles, the symptoms may differ. Some children have for the principal symptoms fever and alternating convulsions and stupor. In others the course is like that of tuberculous meningitis.

When the inflammation is secondary to otitis or a similar preceding condition, or when it complicates some general infection, we observe the symptoms of these affections first, with the meningeal symptoms developing later. We must remember, however, that there may be complicating cerebral symptoms (*pseudomeningitis*) without meningitis, and the only difference between these and those of meningitis is that the latter are more marked and severe.

The *duration* is ordinarily from one to two weeks, but we may have cases lasting from thirty-six hours to four weeks.

The **prognosis** is bad, but not hopeless.

Treatment.—Prophylaxis consists in the *proper management of middle ear disease and diseases of the face, orbit, and nose.* After the disease is established, diminish the severity of the inflammation in the early stages, alleviate the pain, and give sufficient nourishment.

Cold should be continuously applied to the head by means of a coil or ice cap. Bloodletting from the temples and back of the neck and the application of leeches behind the ears is indicated in the early stages. Calomel and magnesium sulphate at the outset, in sufficiently large doses to move the bowels freely, reduce the meningeal congestion. Ergot and potassium iodide are also used to reduce the congestion.

The headache and restlessness may be controlled by opium, phenacetin, chloral, bromide of sodium, and sulphonal. The patient should be kept quiet, free from noise, and in a darkened room. Operative interference should be practised in the cases where an abscess can be localized.

Acute Spinal Leptomeningitis

This is a rare inflammatory disease. It may occur alone, but it is usually seen in *connection with cerebral leptomeningitis.*

Ætiology.—As an extension from the brain, it may be a simple or epidemic inflammation. It may result from an injury to the vertebræ, as from an operation. Acute infectious diseases, especially pneumonia, smallpox, scarlet fever, and typhoid fever, may be complicated with this disease. The inflammation may be tuberculous in character. Cases supposed to be due to wet, cold, and insolation are probably due to some germ infection. The germs of epidemic cerebrospinal meningitis may affect the cord alone.

Pathology.—Although the inflammatory process is usually distributed throughout the length of the cord, it may be localized at different levels. The nature of the exudate depends upon the causative factor. It is usually more abundant at the posterior portion of the cord, owing to the usual position of the patient (in bed, lying on his back). The peripheral portions of the cord are usually infiltrated by the inflammatory products, and the nerve roots are surrounded and compressed by them. Most cases show corresponding lesions in the pia mater of the brain.

Symptoms.—At first we observe the symptoms of irritation of the spinal nerves, pain in the back, pains shooting along the course of the nerves, areas of hyperæsthesia, and spasm and rigidity of the muscles supplied by the nerves irritated. We find rigidity of the spine, with the head thrown back, and sometimes opisthotonus. The larynx may be so firmly pressed against the spinal column, from the retraction of the head and neck, as to cause stridor and obstructive dyspnœa. There is usually an exaggeration of the reflexes, and there may be retention of urine. There is always an irregular fever, seldom higher than 104° F. When pressure takes place from an accumulation of the inflammatory products, we note anæsthesia, complete paralysis, and atrophy. The reflexes are lost, the sphincters are paralyzed, and bedsores may take place.

Differential Diagnosis.—We must distinguish the disease from *myelitis, rheumatism of the dorsal muscles,* and *gonorrhœal rheumatism.* Myelitis causes very little pain and much paralysis. In tetanus, there is trismus, without fever and with the history of an injury. Tuberculous meningitis comes on more slowly and is usually associated with a cerebral process, and there may be signs of tuberculosis in some other part of the body.

The **prognosis** is not good. It is particularly bad in cases of tuberculous origin and in cases where there are high fever, severe pain, and early paralysis. The acute symptoms may subside and leave a chronic meningitis.

Treatment.—Rest, quiet, leeches along the spine, then hot poultices or ice bags are to be used. Mercurial purges and small doses of potassium iodide or of sulphate of magnesium may be given at short intervals. Later, blisters, counterirritation, and lukewarm baths are indicated.

CHRONIC MENINGITIS (CHRONIC LEPTOMENINGITIS)

Chronic meningitis is a rare disease. It is seen in middle age and in those who have been deprived of the necessities of life and much exposed. Tramps and the inhabitants of almshouses are among those affected. Alcoholism and cerebral endarteritis seem to lead to the disease. It may complicate chronic Bright's disease, chronic degeneration of the brain, slow growing cerebral tumors, chronic pachymeningitis, or fractures and inflammations of the cranial bones.

Pathology.—The pia mater, in parts or as a whole, may be thickened, opaque, œdematous, and infiltrated with cells. Adhesions may be present between the pia and dura, and the cortical portion of the brain may show softening or sclerosis. The ependyma of the ventricles may be thickened and roughened, and the ventricles themselves dilated and distended with serum.

The **symptoms** resemble those of chronic pachymeningitis. At first they are obscure and intermittent, making the diagnosis difficult and sometimes impossible. The final symptoms are those of brain compression.

The **prognosis** is not good and recovery cannot be expected. The disease extends over a number of years and results in insanity, or else the patients die with marked cerebral symptoms or in a condition of exhaustion and emaciation.

Treatment.—Syphilis should be excluded by a treatment with mercury and iodide of potassium. Otherwise we can only alleviate the symptoms.

Chronic Leptomeningitis Spinalis

Ætiology.—It may remain after an acute process, or originate as a chronic process, when it may be due to syphilis or alcoholism. It may complicate such diseases of the cord as extend to the membranes, or proceed from without, as from tumors or disease of the vertebræ.

Pathology.—If the process has been acute, the lesions are likely to be extensive; if it has started as a chronic process, it is usually limited. There is a productive inflammation, with thickening of the pia and adhesions to the cord and to the dura. The nerve roots may be compressed and even atrophied. The productive inflammation may invade the cord in an annular form, and it rarely affects the fibres. This is called *meningomyelitis*.

Symptoms.—They are the same as in the acute form, except that the muscular spasm is less prominent. There are pain in the back, increased on movement, radiating about the trunk and down the limbs, tenderness over the spine, stiffness of the back, some twitching of the limbs with weakness, and later anæsthesia, paralysis, wasting, and bladder weakness. There may be cutaneous eruptions, such as herpes. We frequently observe also the symptoms of a primary disease within or without the cord.

Differential Diagnosis.—We must distinguish this disease from spinal irritation, locomotor ataxia, myelitis, vertebral caries, and torticollis. We do not observe in *spinal irritation* the rigidity, severe radiating pains, twitchings, atrophy, or paralysis, and we do observe symptoms of hysteria or neurasthenia. In *locomotor ataxia* the knee jerk is lost, and there is ataxia, with little paralysis and no tenderness over the spine. In *vertebral caries* there are much more localized pain and tenderness and a spasmodic fixation of the trunk. The quality of the pain is dull and more continuous. It is lessened by extension and increased by lateral pressure. Usually there is some deformity. But there may be a local meningitis with caries of the vertebræ.

The **prognosis** is not good, and we cannot look for recovery. However, the patient may live for years.

Treatment.—Rest is the most essential feature. Persistent and systematic counterirritation, as with the actual cautery and cupping, may be of benefit. For drugs, we may give potassium iodide, small doses of the bichloride of mercury, nitroglycerine, digitalis, the salicylates, and ergot. We may also try galvanism, local injections of cocaine, and cataphoresis.

CEREBROSPINAL MENINGITIS IN ADULTS

Synonyms: Cerebrospinal fever, malignant purpuric fever, petechial fever, spotted fever. This is an infectious disease caused by the *Diplococcus intracellularis.* It may occur epidemically or sporadically, and is characterized by an inflammation of the cerebrospinal meninges.

Ætiology.—Although the *Diplococcus intracellularis* is recognized as the cause of the inflammation, the manner in which it enters the system is unknown. The epidemic form occurs in certain regions, seldom widespread, and more often in the country than in the city. Winter and spring are the seasons when the outbreaks have taken place, and poor hygiene, crowding together of people, overexertion, long marches in the heat, and depressing mental and physical surroundings seem to be predisposing factors. Recruits, young soldiers in barracks, children, and young adults are most often affected. The disease does not seem to be contagious through personal contact, nor through fomites, and it is very rare to have more than one case in a house. The sporadic form occurs in both the city and the country.

Pathology.—In the brain the usual changes found in the acute cases are congestion, the veins and sinuses being gorged with blood, and more or less infiltration of the pia mater with an exudate of fibrin, serum, and pus. We may find this infiltration confined to the base or more generally distributed. Along the course of the blood vessels and in the sulci the exudate is more abundant. We find the lateral ventricles filled with serum or a seropurulent exudation. This may distend the ventricles, particularly in children, and continue to do so after the inflammation has subsided, in chronic cases, constituting chronic hydrocephalus. In malignant cases we may find merely extreme congestion. We often find the brain cortex infiltrated with pus, leading to small abscesses. The cranial nerve sheaths, particularly those of the second, fifth, seventh, and eighth nerves, being involved in the process, may lead to neuritis and perineuritis.

The pia mater of the cord shows similar changes, which, from gravity, are found particularly on the posterior aspect of the cord. The cerebrospinal fluid, usually increased in amount, is turbid and contains the *Diplococcus intracellularis*, as well as frequently other pyogenic cocci.

The nature of the inflammation is sometimes unproductive in character, and then there is no serum, fibrin, or pus. The pia mater in these cases may look normal, or it may be lustreless or congested. In the cases running a more chronic course we find the meninges thickened, and there are yellow patches which mark the former location of the exudate. Pathological changes in other parts of the body are not peculiar to this disease, as they are either common to all infectious diseases or due to some complication.

Symptoms.—MALIGNANT FORM.—The onset is sudden, with a chill, headache, high or moderate fever, somnolence, muscular spasms, and great depression. The pulse is feeble and frequently slow. Hæmorrhagic spots usually appear on the skin. The cerebral symptoms develop rapidly. Death may occur in a few days. Although this severe form is usually seen in epidemics, it may occur sporadically.

ORDINARY FORM.—The incubation period is not certainly known, but there may be general malaise for a few hours or days. Usually the onset is sudden, with headache, chill, fever, and vomiting. The fever is variable, but usually only moderate, from 101° to 104° F. In some cases the temperature rises to 108° F. and drops to 97° F. The pulse is usually full and strong, although a high temperature may be associated with a rapid pulse. It varies greatly. The headache is a prominent symptom and is severe. It is usually occipital, but may be parietal, frontal, or general. The pain extends into the back of the neck and may extend into the back. There may be areas of exquisite hyperæsthesia, and particularly there is sensitiveness along the spine. General pains in the bones or muscles are noticed. Vomiting is a severe and distressing symptom, and it has no relation to ingestion of food or drink. It may be projectile in character.

The nervous symptoms of *irritation* are prominent. One of the important early symptoms is a painful stiffness of the muscles of the neck. Opisthotonus may be present, but it is more common to observe orthotonus. The slight forward bending of the head, the "cranelike neck," has recently been mentioned as a diagnostic symptom. Twitchings and spasms of the muscles and automatic movements of the muscles of the arms or legs are frequent. *Kernig's sign* is usually present. It consists in the inability to extend the leg to a straight line on the thigh when the thigh is held at right angles to the body. Babinsky's reflex is often present, but it may be present in other conditions. It is obtained by stroking the sole of the foot, which causes extension of the great toe. In health this irritation will cause flexion of the great and second toes or a rapid withdrawal of the whole foot and leg. It is characteristic to observe exaggerated reflexes.

Irritation of the cranial nerves causes photophobia, often associated with conjunctivitis, intolerance to noises, facial neuralgia, and facial twitchings.

For psychical symptoms, we observe delirium, which may be maniacal. Morbid erotic desires may be present, and from time to time there may be a sudden sharp cry, the "hydrocephalic cry."

Eruptions on the skin are not at all regular. There may be herpes on the lips or face, the serum of which may contain the bacteria causing the disease. Erythematous blotches, urticaria, or petechial spots may be present.

Albumin and casts are usually found in the urine, and polyuria and glycosuria have been present in some cases.

The bowels are usually very constipated, but a few cases have been seen with dysentery. The "boat-shaped" abdomen, due to marked retraction of the abdominal muscles, is often noted. Some patients have severe abdominal pain.

Leucocytosis is an early and constant feature. The white blood cells average from 25,000 to 40,000 to the cubic millimetre.

Later in the disease we note the symptoms of pressure. There is no complaint of headache, but from the moanings and motions we know that it is present. Dulness and apathy increase to stupor and coma. However, there may be periods of low muttering delirium. Photophobia is succeeded by the inability to perceive light. The pupils are usually dilated; no attention is paid to noises; muscular weakness and paralysis succeed the twitchings, and this is most marked in the face and eye muscles, causing strabismus. The temperature continues irregular; the pulse is usually slow, but toward the end becomes rapid and feeble; the respiration may be irregular or of the Cheyne-Stokes variety. Toward the end there may be diarrhœa and loss of control of the sphincters. There may be an ante mortem hyperpyrexia. Cases recovering exhibit a rapid improvement, but usually a long convalescence characterized by headache, insomnia, weakness and pains in the legs and joints, mental dulness, and sluggishness in movements.

Course.—The course of the disease varies greatly. More than half the patients die within the first week. If the case is favorable, improvement generally begins in five or six days, and the worst symptoms improve rapidly. Convalescence is very slow and tedious as a rule, and may be interrupted by sequelæ and complications.

Anomalous Cases.—1. In *young babies* convulsions are a prominent symptom throughout the course, the fever is high, the pulse is rapid, and stupor alternates with restlessness. Death takes place in coma.

2. *Mild Cases.*—Headache, nausea, vertigo, a little fever, possibly stiffness of the neck, and vomiting make a form difficult to diagnosticate except during epidemics.

3. *Intermittent Cases.*—In these cases there are periods of improvement and remission of fever which may last from a few hours to a few days. These periods may be regular and make one think of malaria or pyæmia.

4. *The abortive cases* begin in the regular way, and seem severe, but after a few days there is a sudden change for the better and the patient improves rapidly.

5. A *chronic form* has been described as being relatively frequent. An attack may have a most complex symptomatology, lasting five or six months, showing a series of recurrences of fever, and cause severe marasmus. A chronic hydrocephalus or abscesses of the brain may be the cause of this protraction.

Complications.—Lobar pneumonia is a frequent complication, and bronchitis, pleurisy, pericarditis, and parotitis are not uncommon. Endocarditis is sometimes seen.

We usually see conjunctivitis, but purulent keratitis or chorioiditis, with loss of sight, or optic neuritis with atrophy may occur. The eye complications are due to involvement of the nerves, which causes neuritis, or the inflammatory process may travel along the sheath of the optic nerve. Deafness and otitis media with mastoiditis may occur.

Coryza is frequently an early symptom, and some allege that it may precede the meningitis, which might lead us to think that the infection entered through the nasal mucous membrane.

Arthritis occurs in some epidemics. We observe painful, red, swollen joints, with effusion within and around. Sometimes the exudate is purulent.

Sequelæ.—Chronic hydrocephalus, prolonged prostration, gastric irritability, protracted headache, dilated pupils, mental weakness, forgetfulness, and anæmia are seen. A neuritis may result in a paralysis. There may be partial or complete blindness, from atrophy of the optic nerve, corneal ulcerations, or chorioiditis. Permanent deafness, and in children deaf-mutism, may be the result of a meningitis.

Diagnosis.—The most important signs are fever, headache, delirium, retraction of the neck, tremor, and rigidity of the muscles, but we notice these symptoms in some cases of typhoid fever and pneumonia. In some babies with severe bowel troubles we observe symptoms of meningeal irritation.

Kernig's and *Babinsky's* signs have been spoken of.

Lumbar puncture will furnish us with a specimen of fluid for microscopical examination. There is usually no difficulty in determining between the pneumococcus and the *Diplococcus intracellularis.* If the fluid shows no bacteria, we may inoculate it into a guinea pig. Tuberculosis can thus be diagnosticated.

Method of Procedure in Lumbar Puncture.—The patient is turned on the right side with the back bowed, the knees drawn up, and the left shoulder forward. We may use a local anæsthetic or a few whiffs of chloroform. Under the strictest antiseptic precautions, we insert a small aspirating needle or an antitoxine needle about one centimetre to the right or left of the median line, in the third lumbar interspace, guiding it upward and inward. The needle enters the cord at a variable depth from the surface of the body, according to the age of the individual and the musculature, from 2.5 to 6 cm. The fluid runs drop by drop as a rule, and if there is meningitis, it is likely to be turbid, may be purulent, and sometimes is bloody. Even if it is clear, meningitis may be present.

The **prognosis** is bad, but not hopeless. It depends on the severity of the symptoms, especially those of cerebral origin, and also on the character of the epidemic. The mortality in different epidemics ranges from 20 to 75 per cent. The average mortality is about 40 per cent. Deep coma, repeated convulsions, and high fever are the pronounced symptoms of fatal cases. The endemic cases are usually not so severe as the epidemic cases.

Treatment.—All that we can do apparently is to relieve suffering and treat the symptoms. If the patient is robust, local blood letting by means of leeches applied to the temples or behind the ears, or the application of wet cups to the nape of the neck, is of benefit sometimes. The continuous application of cold by means of the coil or ice bags to the head and spine usually gives relief. Lumbar puncture, if properly done, is harmless and may be of benefit. Hydrotherapy, including warm baths, may be indicated by high temperatures. Potassium iodide is used throughout the disease for its absorbent action. It is given in 20 grain doses three times a day. Salicylate of sodium may be given in 30 grain doses three times a day by the mouth or per rectum. The nervous symptoms demand sedatives. Bromide of sodium, hyoscyamine, phenacetin, atropine, and morphine are used.

Drug stimulants and enteroclysis must be used where heart weakness is evident.

A nutritious diet, consisting of milk and strong broths during the fever, must be maintained. Forced alimentation by means of the stomach tube may be employed in suitable cases.

TUBERCULOUS MENINGITIS IN ADULTS

DIFFERENTIAL TABLE

Tuberculous Meningitis	*Simple Meningitis*
History of tuberculosis.	History of ear disease, etc.
No apparent cause.	Cause evident.
Longer prodromal period.	Short prodromal period.
Longer course.	Short course.
Presence of tuberculosis in the lungs or elsewhere.	No tuberculosis.
Heredity in 20 per cent.	No heredity.

The **pathological** changes in adults are the same as in children, except that in adults it is the exception for the ventricles to be involved. It may be a part of a general tuberculosis, but is usually a localized process, either primary or secondary to a focus elsewhere in the body.

Symptoms.—Some cases show only symptoms of the general tuberculosis, although there exists the meningitis. In some cases marked symptoms of meningitis develop suddenly where apparently there has been previous good health. Some of these are undoubtedly primary cases of tuberculous meningitis, while in others there was somewhere in the body a tuberculous focus from which the infection was carried to the head.

If the invasion is sudden, there is a chill, followed by headache, projectile vomiting, and prostration. If the invasion is gradual, there is a little fever, with headache, loss of appetite, and general malaise. When the disease is established, we observe the typical picture described under acute meningitis. The symptoms may be severe, and the patients die in from one to two weeks; or they may be less severe, with intervals of improvement, and linger from three to seven weeks. In some cases the meningitis develops during the course of a pulmonary tuberculosis.

The **prognosis** of tuberculous meningitis in adults is not good, but some patients with these symptoms recover.

The **treatment** is the same as for the other acute forms of meningitis, with particular attention to nutrition.

ACUTE EXTERNAL PACHYMENINGITIS

This form, which is rare, is secondary to cranial bone disease and to suppurations of the middle ear and mastoid. It may be due to syphilis.

The **prognosis** is good, if the pia or the sinuses are not involved, and if the treatment is proper.

The **treatment** is surgical apart from antisyphilitic management.

CHRONIC INTERNAL PACHYMENINGITIS

Synonyms: Hæmorrhagic pachymeningitis; hæmatoma of the dura mater.

This disease is not common in general practice, but is not uncommon in insanity and degenerative diseases of the brain. Most of the subjects have been alcoholics, and it is almost exclusively found among tramps and almshouse inmates. There may be symptoms of slow or sudden compression. The prognosis should be guarded.

SPINAL PACHYMENINGITIS

Pachymeningitis Externa Spinalis

This form may be acute or chronic. The acute form is due to an extension of a neighboring abscess or of an inflammation of a vertebral bone. The chronic form is almost always tuberculous, and is an extension of a tuberculous process in a vertebra.

Symptoms.—We observe irritation and compression of the anterior and posterior nerve roots of the cord, causing hyperæsthesia, motor spasms, anæsthesia, paralysis, atrophy of muscles, and loss of reflexes. The later compression of the cord itself causes loss of motion and loss of sensation below the level of the lesion.

The **treatment** is symptomatic or surgical with due regard to the underlying condition.

Pachymeningitis Interna Hæmorrhagica Spinalis

The lesions of this disease of the spinal meninges are identical with those of the cerebral meninges in the same disease, and the two are usually associated. That portion of the meninges close to the cerebral meninges is usually affected. We find pain in the back and motor and sensory irritation and impairment. Sudden exacerbations may occur from time to time, due to hæmorrhages with compression.

Treatment does no good.

Pachymeningitis Interna Hypertrophica Spinalis

Pathology.—The dura changes into a thick, fibrous tissue. This at first irritates the nerve roots, then destroys them, and compresses the cord. The process is usually found in the cervical region, and surrounds the cord like a ring.

Symptoms.—During the stage of irritation of the anterior and posterior nerve roots, there are neuralgic pains along their course, referred to the neck, the arms, and the upper portion of the thorax. Hyperæsthesia, tingling, spasm, and rigidity also occur in these regions. During the stage of destruction of the nerve roots and pressure on the cord, there are anæsthesia, paralysis, atrophy, and loss of reflexes. The location of these symptoms depends upon that of the lesion.

The **prognosis,** as to recovery, is bad, but death is usually due to some other disease. Occasionally the disease is arrested, and although there are deforming contractures, the patient may live for years.

Treatment.—In addition to potassium iodide, we may employ counter-irritation and vibration to the diseased portion of the spine.

SYPHILIS OF THE NERVOUS SYSTEM

Nervous derangements due to syphilis often present a most serious aspect, but generally respond readily to specific treatment. The inflammatory process uusally begins in the blood vessels, and extends from there to the meninges and connective tissue structures of the brain and cord.

Inflammatory syphilitic disease of the nervous system may be classed as cerebral, spinal, cerebrospinal, and syphilis of the peripheral nerves.

Cerebral syphilis includes syphilitic endarteritis, syphilitic meningo-encephalitis, syphilitic deposits in the brain itself (gummata), and hereditary syphilis.

SYPHILITIC ENDARTERITIS

Syphilitic endarteritis is one of the simplest forms of brain syphilis. It results in *anæmia* and *malnutrition* of those parts nourished by the vessels involved or in thrombosis and hence softening.

Symptoms.—We observe symptoms of neurasthenia, anæmia, etc., as we should from endarteritis due to other causes. The most characteristic symptoms, however, are temporary attacks of aphasia, paralysis, hemianopsia, weakness, double vision, vertigo, delirium, headache, etc. We think from such symptoms that an apoplexy is imminent, but the process seldom advances to this degree.

The **prognosis** should be guarded, for if the process has gone on to thrombosis, the cure by antisyphilitic treatment is not complete.

The **treatment** should be vigorous. Mercurial inunctions should be given to the point of salivation. They should be preceded by a hot bath and an alcohol sponge to remove all grease and aid absorption. Potassium iodide in large doses should be given, beginning with gtt. xx of a saturated solution and increasing up to xl t. i. d. In extreme cases 500 grains may be given in a day.

SYPHILITIC TOXÆMIA

In this form there may be the general symptoms of neurasthenia, with insomnia and headache. The latter is worse at night. In ordinary neurasthenia the patient feels worse in the morning. In the cases due to a poisoning with syphilis the patient feels worse at night.

The **treatment** is as above stated.

SYPHILITIC EXUDATIONS INTO THE MENINGES

These exudations are likely to occur in the lowest portions of the cranial cavity or at places of least resistance, as at the base of the brain, at the crura, at the sides of the pons, or in the medulla. The disease may affect the cranial nerves. It occurs in from one to two years after the chancre, or it may occur later. The exudation may gather in a short time, so that the symptoms may develop rapidly.

The cortex may be covered by this exudate, creating localized spasms, hallucinations, and supersensitiveness to light (photophobia). These irritation symptoms may be followed by paralysis. There are also headache (which is worse at night), insomnia, irritability of temper, dulness (especially in the morning), restlessness, vertigo, fulness of the head, throbbing in the head, and vomiting, which is sometimes projectile and has no relation to the ingestion of food.

As to the localization of the exudate, there may be involvements of the cranial nerves, especially the third, sixth, seventh, and eighth. The fifth is less frequently involved. There may be optic neuritis, aphasia, convulsions, apoplexy, increased thirst and hunger from disturbance of the frontal lobes, polyuria, etc. The symptoms, in fact, may be those of a tumor of the brain, and we can distinguish them sometimes only by the greater rapidity of development of symptoms in syphilitic cases. Antisyphilitic treatment will surely show the difference.

OTHER SYPHILITIC CONDITIONS

Syphilitic Deposits in the Brain.—There may be small areas of softening or sclerosis—a diffuse syphilitic softening. The symptoms are those of general paresis. The diagnosis is impossible except by trying antisyphilitic treatment (therapeutic test).

Gummata of the brain give rise to the same symptoms as tumors, and can be distinguished only by antisyphilitic treatment.

Hereditary syphilis of the brain causes faulty development, cerebral atrophy, or cerebrospinal sclerosis. Look for other signs of syphilis.

Spinal Syphilis.—There may be the same pathological changes here as in the cerebrum, such as gummata attached to the meninges, arteritis with secondary softening, meningitis with secondary cord changes, or sclerosis developing late in the disease.

The **symptoms** are extremely varied.

Cerebrospinal syphilis gives rise to the symptoms of both brain and cord disease.

Syphilis of the Peripheral Nerves.—It is quite rare that syphilis attacks the peripheral nerves, but we occasionally see cases of nerve irritation and compression due to a syphilitic exudate. There is said to be a form of multiple neuritis produced by syphilis. In cerebral and spinal syphilis the nerve roots may be attacked, causing a radical neuritis.

Treatment.—In general, as regards treatment, *we should always try antisyphilitic drugs in the nervous diseases of obscure origin,* as from time to time we are unable to get a history of a primary lesion.

MISCELLANEOUS LESIONS IN THE BRAIN AND SPINAL CORD, SUCH AS CONTUSION, LACERATION, CONCUSSION, COMPRESSION, HÆMORRHAGE, TUMORS, CYSTS, ABSCESS, SINUS THROMBOSIS, AND PARASITES

In this group of lesions we usually observe *pressure symptoms*, and localization is of practical importance on account of the possibility of surgical aid, which might be indicated except in syphilitic gummata.

INJURIES TO THE BRAIN

CONTUSION AND LACERATION

By contusion and laceration of the brain an injury is meant which is severe enough to cause symptoms due to the contusion or laceration or to be followed by grave symptoms independent of those caused by concussion. The same injuries that occur in other parts of the body may occur here. In addition, peculiar injuries may take place, owing to the nature of the hard bony covering, the blood supply of the brain and cerebrospinal fluid, by contrecoup and by rupture *without external manifestations*.

Symptoms.—We first observe those of *concussion*, and then, from extravasation of blood, those of *compression;* and again, there may be no symptoms of compression. In laceration of the cortex, according to the location and degree of injury, there may be spasms or rigidity of the muscles whose centres are involved, with more or less paralysis. There may be no evidence of a laceration having taken place until after four or five days, or even later, when there may appear convulsions or rigidity of muscles. These later symptomatic manifestations are due to vascular changes, probably in the nature of a spreading œdema or posttraumatic hæmorrhage.

There may also appear, frequently within a few hours, mental symptoms supposed to be due to cerebral irritation. The patient lies on his side, curled up in bed, with the limbs flexed and the back curved forward. The eyelids are kept closed, and although sometimes the patient may be induced to use a bed pan, he usually exercises no control over the sphincters. The pupils are contracted and react to light. The pulse is slow and weak, and the temperature is normal or subnormal. But the most characteristic feature is an intense irritability of temper, a lack of control. The patient seems to wish to lie undisturbed, and if efforts are persistent to rouse him, he may get excited and use strong and even blasphemous and abusive language. It may be necessary to offer him food in order to have him take sufficient nourishment. These mental symptoms gradually disappear in from one to three weeks. The mind may be affected for some time afterward in some cases, and in some it is permanently affected. One may have no remembrance of this mental condition after recovery, or it may remain a hazy recollection.

Diagnosis.—It is often impossible to ascertain the extent of contusion or *laceration* immediately after an injury. The advent of convulsions, rigidity, or paralysis of groups of muscles, from the second to the fifth day, points strongly to contusion. It is stated that œdema of the optic nerve or of the retina is often present in these cases, but absent in pure concussion.

Prognosis.—This depends principally upon the extent of the injury and upon the entrance of infection. Œdema or hæmorrhage may take place and cause death from spreading, which it tends to do. If microorganisms lodge in the bruised brain tissue, death may result from acute encephalitis. Or the purulent process may remain localized and result in an abscess. The spreading œdema may cause a gradual necrosis (yellow softening), which is limited by the amount of vascular disturbance.

Remote changes, such as the formation of a cyst from the lacerated tissue and extravasated blood, may take place. Scar tissue may result, irritating the adjacent tissue, and if situated in the motor area, may give rise to Jacksonian epilepsy.

If arr extensive growth of fibrous tissue results at the seat of the injury (sclerosis) and spreads, it may disturb the brain functions. A descending degeneration takes place, extending down the pyramidal tracts into the spinal cord, in all cases where the cortex in the motor area is lacerated.

Treatment.—As it may be several days before we can determine whether contusion or laceration has taken place, our treatment is largely expectant. The patient should be kept absolutely quiet, the head shaved, and ice bags or Leiter's coil applied. Should extravasated blood give signs of compression, trephining is indicated, and should abscess develop, we should aim to find its location and drain the pus cavity.

MENINGEAL HÆMORRHAGE

Blood may accumulate between the dura mater and the skull or between the dura and pia mater.

Hæmorrhage between the Dura Mater and the Skull

Ætiology.—This is generally due to injury, either from a fracture or from concussion which separates the dura from the bone and tears the middle meningeal artery.

Symptoms.—We observe first those of shock, then those of compression, and then those of meningitis.

The **diagnosis** is very important from a medicolegal standpoint (see chapter on Coma).

The **treatment** is surgical.

Hæmorrhage between the Dura Mater and the Pia Mater

Ætiology.—1. Traumatism; 2. Thrombosis of the venous sinuses; 3. Chronic hæmorrhagic pachymeningitis; 4. Rupture of an aneurysm of one of the cerebral arteries; 5. After convulsions in children; 6. Hæmorrhagic diseases. Under traumata are included the injuries to the new-born from pressure during delivery, as the result of severe labor or from forceps. We find the hæmorrhage at different points, as at the base of the brain, at the convexity, or equally distributed. Cerebral hæmorrhage may make its way to the cortex or through the fourth ventricle, to appear between the membranes.

Symptoms.—These differ according to the situation. If there is a large clot over one cortex, there are sudden coma, stertorous breathing, slow pulse, and abolition of all reflexes. The paralysis may be a hemiplegia or a monoplegia. The paralysis is preceded by twitching of the muscles, which later become paralyzed. At first the temperature falls, even to 96°, but later may rise to 105° or higher. The condition may improve and recovery takes place if the clot is small. Otherwise the patient dies in coma or with symptoms of meningitis. If the clot is small, coma may be absent, but the symptoms of meningitis may develop.

If there are clots over both hemispheres, there are sudden coma and general convulsions. The diagnosis may be difficult in these cases.

If the clots form at the base of the brain, pressure of the medulla, the centre for the vital functions, may cause death in a few hours. Frequently the pressure here causes high temperature.

In the new-born, after a difficult labor, the child may be born dead. It may be deeply asphyxiated and die soon, or recover to go into coma and convulsions and die in a few days. If it recovers, it may have paralyses, sometimes with athetosis, mental defects, and epilepsy. Cerebral atrophy may occur.

The **prognosis** is bad except in those cases where the clot is small. If the patient recovers, there may be paralysis and convulsive movements. In the fatal cases death usually ensues earlier than in cases of cerebral hæmorrhage.

CONCUSSION OF THE BRAIN

By this term we mean the condition into which a person is thrown after a blow upon the head. This may result from one blow or a succession of blows upon the head or from a blow transmitted through the vertebral column.

Pathology.—There are only theories concerning the true pathological conditions. One is that there are multiple minute hæmorrhages, or that the symptoms are due to a vascular disturbance, such as paralysis of brain capillaries with distention and pressure.

Symptoms.—These vary according to the severity of the injury. The mild cases show merely a loss of consciousness for a few seconds, with arrest of respiration and pallor. Recovery is rapid. In case of severe injury, however, a person may die in a few minutes. The cases coming between these two extremes show the following symptoms:

1. Stage of Collapse.—There is sudden loss of consciousness; the patient may be roused by shouting or pricking, or the unconsciousness may be complete; this may last from a few seconds to several days. The pulse is weak and, as a rule, slow. The skin is pale and cold. The respirations are slow, shallow, and sometimes irregular. There is a temporary muscular paralysis, although usually the patient will swallow fluid introduced into the mouth. Pinching or pricking the skin will arouse the patient in all except the severe cases. In mild cases the reflexes are present, but in severe cases all are lost, even the corneal. The pupils are equal, more or less dilated,

and react to light except in grave cases. There may be loss of control of the sphincters from relaxation, not from paralysis. The temperature in the rectum is always subnormal, even down to 96° or 95° F.

2. STAGE OF REACTION.—Vomiting is one of the first signs of returning consciousness. An epileptoid convulsion may take place. The pulse gradually becomes stronger, the skin warmer, and the respiration deeper and more regular. The temperature usually rises slightly, but seldom to over 100° F. As consciousness returns the patient usually complains of headache. He now rapidly becomes convalescent, unless compression or laceration exists, their symptoms usually showing in this stage. Occasionally, after reacting, the patient may become comatose and die. Death in these cases seems to be due to encephalitis or spreading œdema.

3. STAGE OF CONVALESCENCE.—This may last from a few days to weeks or months, but if it lasts as long as weeks or months, the condition is probably one of contusion or laceration.

Diagnosis.—Under the subject of *Compression of the Brain* the differential diagnosis will be discussed.

The **prognosis** in uncomplicated cases is good, though posttraumatic dementia may develop.

Treatment.—Make the body warm, and lower the head. The head should be shaved and carefully examined for injury. We must be careful about using alcohol or other strong stimulants, on account of danger of increasing the hæmorrhage, if any of the vessels are ruptured, and also of causing hyperæmia of the brain, which may lead to spreading œdema. Still, we had better give a stimulant if it is decidedly indicated. To increase the heart's activity, we may irritate the skin with a sinapism over the pit of the stomach, over the heart, and on the calves of the legs. If mustard is not at hand, hot water and a sponge may be used. We may subcutaneously administer a mixture of ether and camphorated oil, repeating the dose according to the need. As the patient can swallow, we can give him large doses of musk by the mouth, which tends to improve a small and irregular pulse. A good stimulant is the electric brush applied over the palms of the hands and the soles of the feet. Brief inhalations of ether may be helpful.

When the patient does not breathe, or when the respirations are superficial or irregular, we may resort to artificial respiration, keeping it up for a long time if necessary.

If there are subsequent symptoms of cerebral congestion, apply an ice cap to the head, apply dry cups to the chest and back, administer a drastic cathartic, perform venesection and give morphine to quiet the patient if necessary. Lumbar puncture and trephining may be indicated when the symptoms of compression (unconsciousness and a small pulse) are urgent.

COMPRESSION OF THE BRAIN

There may be a general compression of the whole central nervous system caused by an increased pressure of the cerebrospinal fluid, a localized pressure directly on some part of the central nervous system.

Ætiology.—The causes include those that are *traumatic*, such as depressed fracture, collections of pus, serum, or lymph, a foreign body, and effused blood; and *tumors*, such as gummata, carcinomata, sarcomata, gliomata, osteomata, angeiomata, and tuberculous growths.

Symptoms.—Usually the compression sets in gradually, and, no matter to what it is due or where it is located, we observe these general symptoms:

CONSCIOUSNESS.—At first there is headache, which increases gradually, with drowsiness. This drowsiness becomes insensibility of a greater or less degree, and finally coma, which varies in intensity according to the degree of compression.

CIRCULATORY SYSTEM.—A slow, full, heaving pulse is characteristic, but if the compression is severe, the pulse becomes rapid and irregular.

RESPIRATORY SYSTEM.—Moderate compression causes regular, slow, and deep respirations, but in severe compression we find them rapid and irregular, almost approaching the Cheyne-Stokes type. When death occurs, the respirations stop first, and the pulse may continue for hours, sometimes, if artificial respiration is performed.

MOTOR SYSTEM.—Convulsions are present if the intracranial pressure is raised rapidly, but, as the pressure is usually gradual in development, they are rare. The voluntary muscles are usually progressively paralyzed. Hemiplegia is generally present for a time, as the paralysis begins, but gradually the other side also becomes paralyzed. Now the respirations become stertorous, and the lips and cheeks are blown out, showing that the muscles of the soft palate, the lips, and cheeks have become affected. Both sides of the body may be affected equally if the pressure in the brain is equally distributed, or a single group of muscles if the compressing agent is small and localized.

SENSORY SYSTEM.—The patient may respond to skin irritation early in the compression, but later all sensibility is gone.

The REFLEXES gradually disappear.

PUPILS.—If the cerebral pressure is equally distributed, the pupils are equal, at first contracted, then dilated and immobile. If the point of pressure occurs on one side first, which is usual, the pupil on that side contracts first and then dilates, while the other remains normal. As the pressure increases, however, the other pupil goes through the changes, until both are widely dilated and immobile.

CHOKED DISC.—The sheath of the optic nerve being formed by the dura and arachnoid of the brain, increased pressure of the cerebrospinal fluid causes pressure on the optic nerve. Blood may also be pressed along the sheath, or there may be direct pressure against the nerve. Swelling of the nerve and resulting œdema cause the swelling of the optic disc on the retina, choked disc, which is a diagnostic point in brain compression.

The SPHINCTERS are paralyzed, although the rectum is not. The bladder is paralyzed, and we observe retention and then a dribbling overflow.

The TEMPERATURE is at first subnormal, but it rises with the increase of pressure, so that in some fatal cases there is very high fever. The side of the body opposite to the lesion, if it is limited to one side, may be slightly warmer than the other.

Diagnosis.—From the fact that both concussion and compression of the brain are due to injury, there is often great difficulty, at first, in distinguishing between the two. We cannot lay much stress upon the pulse or upon the unconsciousness. The condition of the muscular system, however, enables us to make the distinction. In concussion the muscles are more or less flaccid, and are not moved voluntarily until consciousness returns. Then, however, they can be moved, showing the paralysis to be only functional. In compression, however, the paralysis is complete, and even if consciousness returned, paralysis would remain. The loss of muscular tone is greater in compression, as is shown by the stertor and blowing out of the cheeks during expiration. Muscular paralysis can be recognized easily in the early stage of compression by comparing the two sides of the body. There is a difference in the tonicity, which may be especially noticed in the face muscles.

The effect of concussion on the bladder and rectum is different from that of compression. In both cases the sphincters are relaxed, but there is no marked paralysis in concussion.

The pupils in concussion are either not at all affected or else more or less dilated equally on both sides. They react to light except in cases of very severe concussion. In compression they are unequal while the compression is advancing, and in the final stage they are equal, are widely dilated, and do not react to light. Choked disc is usually present in compression after forty-eight hours.

In regard to the state of coma, there are other conditions inducing it, and they must be distinguished. During the course of some diseases, such as epilepsy, meningitis, tumors of the brain, renal disease (uræmia), diabetes, etc., coma may arise. Injuries to the head, alcoholic and narcotic poisoning, cerebral hæmorrhage, embolism and thrombosis, heat stroke and exposure to cold may all induce coma. For the distinction, see table in the chapter on Coma.

To make a diagnosis at a moment's notice is often impossible, and we should never decide at once, but keep the patient in bed under observation for at least forty-eight hours.

Localizing Symptoms.—The pressure at certain points in the brain may give rise to symptoms which would tell us the location of these points. (See Brain Abscess and Brain Tumor.) We should notice, therefore, any difference between the two sides of the body in the musculature and temperature, and any difference in the pupils.

Prognosis.—If the compression is not removed, the symptoms grow worse usually and death results. Sometimes the pressure is relieved spontaneously, and sometimes the brain becomes accustomed to it, and recovery gradually takes place. If the point of pressure is at a place which can be reached by operation, and the cause is removed, particularly in depressed fractures and blood clots, and the removal is effected early, the prognosis is good.

Treatment.—Surgical methods are the only resource. The operation should be done early, preferably in the first stages, where the symptoms are those of irritation, and before the changes in the retina have advanced further than venous congestion. If pressure is allowed to continue for any length of time, the brain is likely to undergo atrophy or softening, or calcify in patches, resulting in damage which Nature cannot heal.

TUMORS OF THE BRAIN

In order of frequency, we find gummata, tuberculous tumors, gliomata, sarcomata, carcinomata, occasionally fibromata, osteomata, cholesteatomata, angeiomata, lipomata, and echinoccus and cysticercus cysts and other cysts. Aneurysms of the base of the brain may give rise to symptoms of tumor.

The *gummata* usually begin in the meninges, may be found on the base or cortex, and are hard or soft.

The *tuberculous growths* may be found anywhere. They may be primary, but are usually secondary. They are hard, often multiple, and are more frequent in children, more than one half of the brain tumors in children being tuberculous.

Gliomata are usually situated in the white substance. These tumors resemble the nerve tissue, being composed of cells and fibres like the neuroglia. They grow singly, usually in an infiltrating manner, without capsule or boundaries, but often are vascular, making the symptoms vary. Hæmorrhage may take place. Sometimes the growths are hard. They are often combined in a sarcomatous growth.

Sarcomata usually develop from the connective tissue of the membranes, but they may arise in the brain or from the bones. We find all varieties, fibrosarcoma, round celled and spindle celled sarcomata, gliosarcomata, and myxosarcomata. They are hard, single, well defined, easily separated, of various sizes, and may be found on the base, in the meninges, and in the cerebellum.

Carcinomata are rare and usually secondary. Cancer or sarcoma beginning in the meninges may invade the bones and appear externally, forming the "fungus hæmatodes" or "perforating tumor of the dura."

Ætiology.—*Age:* Children, being most liable to tuberculous growths, are oftenest affected. Young adults are next liable, and tumors seldom occur in the brains of old people, except carcinomata.

The exciting causes are usually unknown.

Pathology.—According to Starr, the tumors are in the cortex in 25 per cent of cases, in the cerebellum in 25 per cent, in the centrum ovale in 15 per cent, in the basal ganglia in 10 per cent, in the pons in 10 per cent, and in the crus and corpora quadrigemina in 10 per cent. Other situations show the tumor in about 5 pe· cen

The brain tissue in the vicinity of a tumor may be hyperæmic and inflamed or softened and destroyed. If the growth involves the pia mater, there will be localized chronic meningitis. Pressure on a venous sinus may cause hydrocephalus. There are other vascular disturbances. The cranial bones may be thinned out and the sutures and fontanelles separated.

Symptoms.—These are divided into two groups. The first group comprises the general symptoms of irritation and compression irrespective of the situation of the tumor; the second, those symptoms dependent upon the locality of the tumor.

General Symptoms.—*Headache* occurs in 95 per cent of all cases. It is dull, deep, and stupefying as a rule, constant or remittent, general or local, and is likely to be intensified by any factor disturbing the circulation in the brain. There may be local tenderness, shown by percussion of the cranium, and even in stupor or sleep the patient may be seen to have pain. The severity of the pain may be excruciating, and it is often worse at night, especially when the tumor is syphilitic. The patient may have the sensation of a band about the head. In every case of persistent headache the patient should receive an ophthalmoscopic examination.

Mental disturbances occur in 85 per cent of all cases. The patient becomes dull, apathetic, and inattentive; the memory becomes affected; depression is present; and childishness and an emotional condition, even to dementia and insanity, may develop. The speech is slow, fainting attacks occur, and finally there are stupor and coma. Hysterical symptoms should make one think of brain tumor.

Optic neuritis occurs in 80 per cent of the cases, and is usually bilateral. The vision may not be affected for some time, but an ophthalmoscopic examination will show on the fundus venous congestion, swelling of the papilla, loss of the disc outline, hæmorrhages, and a radiating appearance about the disc. Later, as vision fails, we observe atrophy of the optic nerve, which causes the disc to appear gray or white. The optic nerve changes may be absent in cases of small subcortical tumors. With the progressive advancement of the optic nerve atrophy, impairment of vision, narrowing of the visual field, and even blindness may result.

Vomiting occurs in about 50 per cent of the cases, and is more frequent in tumors of the posterior fossa. It is "purposeless," having no relation to stomach conditions, and is often projectile in character.

Vertigo is present in about 75 per cent of the cases. It is most constant and severe in tumors of the cerebellum, but may occur with tumors anywhere upon a change in the position of the patient. It may be present even when the patient is lying in bed.

General epileptoid convulsions (*petit mal or grand mal*) may be present, particularly in cerebral tumors.

The *pulse* is usually slow, averaging between 50 and 60.

Nystagmus, a lateral oscillation of the eyes, is frequently present, but more particularly with disease of the corpora quadrigemina and cerebellum.

Loss of control over the sphincters is especially present when the tumor is involving the frontal lobes.

Glycosuria and *polyuria* may be symptoms, particularly when the tumor is in the posterior fossa. The *bowels* are usually constipated.

LOCALIZING SYMPTOMS depend upon the position of the tumor.

Frontal lobes. A tumor situated in this region causes mental dulness, lack of control over the emotions, irritability, inattention, childishness, or dementia. There may be loss of the sense of smell. If the third left frontal convolution is involved, there is motor aphasia.

The *central convolutions* and the motor tracts. A tumor here may cause monospasm (Jacksonian epilepsy), which may be preceded by a sensory aura. Monoplegia may follow. These two symptoms indicate that the tumor is near the cortex. When it is deep, or in the capsule, we observe hemispasm and hemiplegia. Slight anæsthesia may be present in the paralyzed part.

The *occipital lobe* and the visual tract. There is hemianopsia, which is spoken of by the patient as half-blindness. We also note flashes of light on one side and hallucinations of vision.

Left temporal lobe, first and second convolutions. A tumor here gives rise to sensory aphasia (word deafness).

Left lower parietal lobe and angular gyrus or occipitotemporal tract involvement gives rise to sensory aphasia (word blindness).

At the *base of the brain* a tumor causes symptoms according to its situation.

In *the anterior fossa* it may cause loss of the sense of smell.

In *the middle fossa* it occasions hemianopsia and paralysis of the ocular muscles through the third, fourth, and sixth cranial nerves; neuralgia of the face and anæsthesia, by involvement of the fifth nerve; opposite hemiplegia, neuroparalytic ophthalmia, nystagmus, bilateral spastic paralysis, and deafness.

In *the posterior fossa* it may cause paralysis of the seventh, ninth, tenth, eleventh, and twelfth nerves; vertigo and ear symptoms; and cerebellar ataxia, a tendency to incline or fall to one side.

The *medulla*, if involved, may cause widespread paralysis, either paralysis of the cranial nerves alone or hemiplegia with convulsions.

Involvement of the *cerebellum* causes vertigo, vomiting, headache (which may be frontal or occipital), and early optic neuritis. If the middle lobe is involved, we observe the peculiar cerebellar ataxia and a pitching or reeling gait.

Differential Diagnosis.—We determine the existence of a brain tumor from the general symptoms alone, or the local symptoms alone, or both the general and local symptoms. We have to distinguish tumors from *chronic nephritis* by examining the urine and noting the condition of the heart, arteries, and blood pressure; by an examination of the fundus of the eye; by the character of the headache, which is more severe in tumors; and by the age of the patient. Tumor is more frequent in young persons. There are no local spasms in *uræmia*. By means of an eye examination, prescribing glasses, and counteracting anæmia by medication, we can exclude *hypermetropia* and *astigmatism*. The headache is not severe in these cases. By studying the patient, and by the condition of the optic disc, we may exclude *hysteria*.

ABSCESS of the brain usually involves a history of injury or otitis media. There is often fever, the early symptoms are severe, and optic neuritis is rare.

The *situation of the tumor* is indicated by the study of the symptoms. The "signal symptom" is a term applied to a beginning spasm or paralysis, such as numbness and twitching of the thumb, which gradually extends to the hand and then the arm. The order of appearance of the local symptoms is an aid, such as first thumb, then hand, arm, and face. Then we may compare the local symptoms, such as paralysis with aphasia and paralysis with hemianopsia.

The *variety of tumor* can sometimes be determined. According to the age of the patient and the rapidity of growth, we may surmise the nature of the growth. The history may help in syphilis, tuberculosis, cancer, or sarcoma. The rapidity of the onset may guide us, as tubercle and cancer advance rapidly. The signs of irritation are more frequent in glioma and meningeal tumors. The degree of variety in symptoms may guide us; there is more variation in the symptoms caused by glioma. Gummata, tubercles, and sarcomata are more likely to involve the base of the brain. Intracerebral tumors are often gliomata or sarcomata. Sarcomata of the pituitary body or aneurysm may cause early optic neuritis or a peculiar form of hemiopia.

Course.—Usually we see general symptoms, but there may be first a local spasm or a general convulsion, with a "signal symptom." The number and severity of the symptoms gradually increase, and finally death occurs in stupor, in general convulsions, or suddenly from heart failure. Recovery may take place after specific treatment or from an operation if the tumor is accessible.

The **duration** is from one to three years.

The **prognosis** is bad, except where syphilis is the cause, and where the situation permits of removal.

Treatment.—To exclude gumma, give inunctions of mercury, with potassium iodide up to 300 grains or more daily. Tuberculous tumors have been reported to have undergone encapsulation and calcareous change in consequence of appropriate tonic treatment.

Surgical treatment is effectual when the tumor has caused the symptoms leading to its exact localization. Unfortunately, less than 5 per cent (Dana) are "operable." An exploratory trephining is many times indicated when doubt exists. There is likelihood of a return after removal.

THROMBOSIS OF THE VENOUS SINUSES

Ætiology.—*Primary* or marantic thrombosis may take place in cachectic patients or in the aged, and cause death. Exhausting diarrhœa in children under six months may rarely lead to thrombosis.

Secondary septic thrombosis occurs as a complication of inflammatory conditions of contiguous parts or disease of the middle ear, fracture, or suppurative conditions outside the skull, particularly erysipelas, carbuncle, and parotitis. These cases are much more frequent than the primary cases. **Secondary non-septic thrombosis** may complicate embolism or pressure on a sinus by cerebral tumors.

Pathology.—The obstruction to the circulation of that part of the brain affected by the lodgement of the clot in a sinus results in intense congestion and œdema of that part. Softening of this area of brain tissue may ultimately take place. The septic thrombi soften, disintegrate, and may give rise to purulent meningitis and embolic abscesses, which often take place in the lungs.

Symptoms.—For general cerebral symptoms, there are usually apathy, stupor, delirium, convulsions, muscular rigidity, vomiting, optic neuritis, and coma. It is seldom that localizing cerebral symptoms occur, and the condition is found only at autopsies, sometimes, where no exciting symptoms had existed. The involvement of the superior longitudinal sinus gives rise to the most marked cerebral symptoms, although they are never characteristic. The symptoms of the most diagnostic importance are œdema and distention of the veins outside the skull, in the parts where the veins pass through the bones to join the internal sinuses. If the superior longitudinal sinus is thrombosed, we observe congestion and œdema of the sides of the head and forehead, prominence of the anterior fontanelle in children, and epistaxis. Thrombosis of the cavernous sinus causes œdema and congestion of the eyelid and prominence of the eyeball. Thrombosis of the lateral sinus causes œdema and congestion over the mastoid.

If we have to deal with a septic thrombosis, we observe chills, intermittent or remittent pyrexia, and the typhoid state. Meningitis and abscess of the brain, as complications, will give rise to their symptoms.

The **duration** of the disease is from a few days to several weeks.

The **prognosis** is bad, unless the thrombus is small and non-septic.

Treatment.—Potassium iodide and calomel have been recommended for the cachectic form. Operative treatment has given some brilliant results.

ABSCESS OF THE BRAIN (SUPPURATIVE ENCEPHALITIS)

Ætiology.—1. It occurs from continuity through the *cranial bones*. In about 35 per cent of cases abscess arises from injury to the scalp or skull; in about 10 per cent from caries of the cranial bones; in about 40 per cent from diseases of the middle ear; and in about 10 per cent from chronic suppurative rhinitis. There is often an associated meningitis.

2. Through the *blood vessels*. During the course of pyæmia, malignant endocarditis, gangrene or suppuration of the lung, empyema, or an infectious disease, septic emboli may lodge in the brain.

Pathology.—The abscess results from an acute encephalitis with the formation of pus. The collection of pus may not be encapsulated, and then it extends rapidly with fatal results. Or it may be encapsulated and develop slowly. Sometimes it may remain stationary for a number of years, causing no symptoms, but ultimately enlarge or break. Multiple abscesses may form, secondary to pyæmia, which add cerebral symptoms to those of the pyæmia. The abscess may break through into a ventricle or through the cortex, causing meningitis. The course of abscesses of the brain may be acute or chronic.

Symptoms in Acute Cases.—1. SYMPTOMS OF PRESSURE.—There is headache, severe, constant, possibly localized; then follow vomiting of a cerebral nature, usually optic neuritis, generally irregularity of the pupils, slowness of the pulse, 60 to 70, alternating drowsiness, restlessness, and delirium, and finally coma.

2. SYMPTOMS DUE TO PYÆMIA.—There is a chill with the onset, often repeated during the disease. There is irregular fever, but as a rule we see periods of normal or subnormal temperature. The typhoid condition finally supervenes.

3. LOCALIZING SYMPTOMS.—Irritation or destruction of some portions of the brain, as in brain tumors, gives rise to special symptoms. Convulsions may be confined to certain groups of muscles. There is paralyses, hemiplegic or monoplegic, also aphasia. Phlebitis causes œdema behind the ear and a sensation of fulness over the jugular vein. Meningitis causes rigidity of the neck and cranial nerve paralysis. If the abscess is located in the frontal

lobes, it is usually caused by disease of the nose or ethmoid cells. Mental dulness may be the only symptom. In the temporosphenoidal lobe an abscess may cause no symptoms; if it is in the parietooccipital lobe hemianopia may result. Vomiting, vertigo, and a staggering gait usually accompany a cerebellar abscess.

A CHRONIC ABSCESS, developing in a part of the brain not specialized ("silent region"), may become encapsulated without causing symptoms. The patient may be subject to headache and vertigo. Sooner or later the abscess ruptures into a ventricle or on to the cortex, and sudden coma or convulsions ensue.

The **diagnosis** is made from the history, showing a cause of infection; from septic symptoms; and from localizing symptoms.

DIFFERENTIAL DIAGNOSIS (STARR)

Abscess	*Meningitis*
Temperature normal or not high.	Temperature high without remission.
Pulse slow.	Pulse rapid.
Patient in stupor.	Irritable, all the senses overacute.
Spasms and rigidity rare.	Frequent.
Cranial nerves not involved.	Involved early.
Optic neuritis frequent.	Rare.

Abscess	*Thrombosis of Lateral Sinus*
Temperature normal or not high.	High with remissions.
Pulse slow.	Rapid, weak.
Chill at the onset, not repeated.	Frequently repeated.
Little sweating.	Profuse sweating.
Head tender to percussion.	Pain over the mastoid and jugular.
No thrombi.	Thrombi in the lungs.
No œdema.	More or less general œdema.

The **prognosis** is grave unless the pus can be evacuated.

In *non-purulent* hæmorrhagic encephalitis following grippe, pneumonia, malarial disease, and typhoid fever the prognosis is not bad.

The **treatment** is surgical. With improved knowledge in diagnosis, in the treatment of middle ear and sinus suppurations, and in surgical technique, the mortality is decreasing.

PARASITES OF THE BRAIN

These are very rare in this country, but we occasionally find tumors due to the echinococcus and the *Cysticercus cellulosæ*. The former produces hydatid cysts, such as are found in the liver. These cysts may be large or small, few or many, and are almost always on the surface of the brain.

The cysticerci also form cysts, usually on the surface or in the ventricles, commonly multiple and generally encapsulated. As a rule, they give rise to no symptoms, but there may be persistent headache, convulsions (limited or general), and gradually developing blindness—the same symptoms as those of tumors.

The **treatment** is surgical.

INJURIES OF THE SPINAL CORD

Concussion.—Under this head we usually speak of such slight lesions as very small lacerations, hæmorrhages, or contusions. It has been described under Railway Spine.

Laceration and contusion of the spinal cord may be extensive. They are usually associated with severe fractures or dislocations of the vertebral column. There is paralysis, which corresponds to the portion of the cord injured. It is possible for a complete, although slow, recovery to take place.

Compression of the cord, either from a displaced bone, blood clot, or foreign body, such as a bullet, may take place. A blood clot from a hæmorrhage into the meninges or cord gives rise to intense pain in the back, hyperæsthesia, muscular spasm, rigidity, the sensation as if a cord were tied around the waist, and rapidly developing paralysis.

Compression due to bone causes symptoms immediately after the injury. These symptoms are likely to be more serious, and although the bone may be removed, the damage may be permanent.

Wounds of the Spinal Cord.—There may be a complete division of the cord by fractured or dislocated bones, by a knife, or by gunshot or other injury. There may be an escape of the cerebrospinal fluid. We may observe clear symptoms, indicating the situation of the injury. Sometimes, however, a less severe injury will cause symptoms of complete division of the cord. These may be due to the hæmorrhage and œdema. More often there is a considerable portion of the cord injured, and the symptoms are extensive and not well defined. Cysts and abscess may form. Sepsis is not the rule. The paralysis is usually permanent.

The TREATMENT is surgical or symptomatic.

Tumors, cysts, abscess, and **parasites of the spinal cord** cause symptoms of irritation and compression which point to the affected locality.

The TREATMENT is symptomatic, antisyphilitic, or surgical.

HÆMORRHAGE INTO THE SPINAL MEMBRANES

Synonyms: Extramedullary hæmorrhage, spinal apoplexy.

Ætiology.—This is a rare condition. It may be caused by blows and concussions; chronic pachymeningitis hæmorrhagica; rupture of an aortic aneurysm into the spinal canal after erosion of the vertebral bones; rupture of an aneurysm of the vertebral or basilar artery; hæmorrhagic diseases, such as purpura hæmorrhagica and scurvy; and convulsions or tetanus; or it may be a lesion in caisson disease. Blood from the cranium may make its way downward between the membranes.

Pathology.—The hæmorrhage may be extrameningeal, between the bones and the dura, or intrameningeal, between the membranes. It is most frequent in the cervical region. It is quite rare for a sufficient amount of blood to escape to compress the cord.

Symptoms and Diagnosis.—We observe suddenly the symptoms of spinal irritation without fever. These are pain, radiating along the course of the nerves, muscular rigidity and spasm, and later some motor and sensory paralysis, although never to any great degree. The situation of the hæmorrhage determines the nature and seat of the symptoms. If the cord is compressed, there may be a resulting myelitis. Spinal puncture may aid in diagnosis.

The **prognosis** is not good. Perfect recovery, however, is seen after slight hæmorrhages. The prognosis is better in extramedullary than in intramedullary hæmorrhage.

Treatment.—Apply ice bags to the spine while the patient is prone. Ergot is indicated in full doses early in the disease. Later, when there is no more bleeding, we treat as for myelitis.

Surgical treatment may be indicated.

REMARKS ON THE SYMPATHETIC NERVOUS SYSTEM

There is much about the physiology and pathology of the sympathetic nerves which is not known. We know that the sympathetic system consists of a chain of ganglia along either side of the spine, united by intervening and some transverse branches; that the ultimate distribution of all terminal branches seems to be in connection with the small vessels; that there are subdivisions into plexuses—the cervical portion with the cavernous plexus and carotid plexus, the great solar plexus, the thoracic branches with the great splanchnic nerve, the pelvic plexus, and numerous smaller plexuses.

The functions seem to be varied, but probably this system has largely for its office the control of the blood supply in the various organs and parts of the body. Indirectly it probably is concerned in the secretion of sweat and the function of various glands. In particular, the cervical sympathetic controls the dilatation of the pupil; it supplies motor fibres to the unstriped muscular fibres of the orbit; it controls the action of the salivary glands and sweat glands of the face and neck. It also sends vasomotor branches to the ear, the side of the face, the conjunctiva, and the eye, throat, brain, and its membranes.

In the thorax, the sympathetic nerves supply accelerator fibres to the heart. The great splanchnic nerve takes its origin from the sympathetic system.

In the abdomen and pelvis, it is associated with the motor and vasomotor supply of the large intestine, bladder, uterus, vas deferens, and vesiculæ seminales. The branches of the sympathetic are very numerous in the suprarenal capsules, having connections with the renal and solar plexuses.

Pathology.—In regard to the morbid changes in this system very little is known, and much that is written is conjectural and hypothetical.

The *cervical portion*, being the most superficial, may suffer from penetrating, incised, and gunshot wounds, blows, contusions, and pressure from such tumors as aneurysms, enlarged glands, exostoses, and malignant growths. It may be irritated by affections at the apices of the lungs and of the contiguous pleura. The acute infectious processes seldom may involve it. Cerebral lesions may involve this portion, and its irritation has been noted in some cases of hemiplegia. Hyperidrosis has been described when a pathological condition existed in the seventh nerve, also symptoms of paralysis of the cervical sympathetic with incomplete closure of the palpebral cleft. The part of the brain connected with the cervical sympathetic is supposed to be the optic thalamus.

Hyperidrosis, dilatation of the pupil, and widening of the opening of the lids are symptoms of cervical sympathetic irritation. If there is paralysis, we observe opposite symptoms, such as a contracted pupil, sometimes associated with a slow reaction to light; narrowing of the opening between the lids; in old cases retraction of the bulbus oculi; occasionally increased redness and warmth in the ear and cheeks; and in a few cases an increased secretion of sweat. In both cases there are sometimes slight trophic disturbances in the cheeks. In some cases of complicated paralyses of the brachial plexus, which are usually traumatic, symptoms of paralysis of the sympathetic have been observed, such as contraction of the pupil, narrowing of the opening between the lids, and retraction of the eyeball on the paralyzed side. This is probably due to a lesion of the branch of the sympathetic communicating with the first dorsal nerve. Vasomotor symptoms in the face are usually missing, although a peculiar flattening of the cheeks has been observed.

There are theories that the sympathetic is pathologically involved in cases of goître. Migraine has been supposed to be due to an affection of the sympathetic. Irritation in the area of the splanchnic nerve in the abdomen in lead poisoning is supposed to be the cause of the colic and the constipation.

ANATOMICAL ANOMALIES

ABNORMITIES OF THE BRAIN

The term **anencephaly** is applied to those cases where the brain is absent or rudimentary. The cerebellum and part of the basal ganglia may be present, making it possible for the child to live a short time.

Cyclopia is a malformation in which the orbits form a single continuous cavity. It is also called *synophthalmia*.

Acrania is an entire absence of the bones and integuments forming the vault of the skull. It is usually associated with anencephaly.

Meningocele and **meningoencephalocele** are hernia of the brain membranes, arachnoid, and dura through a cleft in the skull. When the brain also protrudes, it is called *encephalocele*. These usually occur in the median line of the occipital region. When there is a hernial sac with fluid contents, it is called *hydrencephalocele*.

Porencephaly.—A congenital defect in the nutrition of the brain leads to a cavity or depression in the cerebral hemispheres which reaches generally into the lateral ventricle. It is probably due to some intrauterine accident causing anæmia and softening, hæmorrhage, or thrombosis. It is one of the causes of cerebral palsies in children.

Microgyri and **atrophies of the cortex** are observed.

MALFORMATIONS OF THE SPINAL CORD

Spina Bifida (*Rhachischisis Posterior*)

This is the name given to a congenital hernia of the membranes of the cord, and sometimes of the cord, through a cleft in the vertebræ, due to absence of the vertebral arches.

Ætiology.—Hereditary influence is sometimes considered a factor. It is not rare, and is often associated with hydrocephalus or some other developmental defect, such as imperforated anus, ventral hernia, etc.

Forms.—SPINAL MENINGOCELE is the form where only the membrane protrudes into the hernial sac.

In SPINAL MENINGOMYELOCELE the membranes and cord both protrude.

MENINGOMYELOCELE (hydrorrhachis interna) is a form in which the inner lining of the sac is formed by the thinned out spinal cord with distention of the central canal of the cord.

The first two forms are the more common, and are called *hydrorrhachis externa*. The subarachnoid sac is the inner wall of the cyst. In two thirds of the cases both the nerves and the cord protrude into the sac, but in some of these only a few nerves are found. When these structures are present in the sac, they lie on the posterior median surface. These tumors contain cerebrospinal fluid and sometimes connective tissue and fat.

Spina bifida is usually seen in the lumbar region, and seldom more than two or three vertebræ are involved. We see a difference in the size of the tumors, as they may vary from 3 to 15 cm. in diameter. The base may be sessile or pedunculated. The outer skin may be glossy, tough, thickened, or ulcerated.

Symptoms.—Feebleness, poor nutrition, and mental feebleness are usually seen in these children. One half of the cases are paraplegic, and sometimes there is involvement of the sphincters and anæsthesia. Not infrequently we see talipes.

Prognosis.—Without treatment the cases are usually hopeless, and even with treatment they are grave. Spontaneous closure is occasionally observed.

Diagnosis.—We have to distinguish spina bifida from congenital tumors in the region of the lower vertebræ. If there is much anæsthesia, paraplegia, and sphincter trouble, we may conclude that the cord is in the sac, which is very important to know. To be positive, we may introduce an insulated needle connected with a battery with a view of eliciting peripheral symptoms.

The **treatment** is surgical, but it is best to withhold operations until the child is at least three months old. (See also Pædiatrics.)

OTHER MALFORMATIONS

Amyelia.—Absence of the spinal cord does not exist unless the brain is absent. The spinal nerves are usually present in amyelia. In such cases the patients cannot live.

Double cord is a very rare condition. Unless there is a double canal, the defect exists in only a part of the vertebral canal.

A **double central canal** involving only a part of the cord is not rare.

Asymmetry of the cord is not particularly rare. It is commonly due to an abnormity in the pyramidal tracts.

Splitting of the cord is occasionally seen, as well as defects at various levels.

Micromyely is not very rare.

STIGMATA OF DEGENERATION (PETERSON)

Anatomical Stigmata.—*Cranial Anomalies.*—Facial asymmetry; deformities of the palate; anomalies of the teeth, tongue, lips, or nose.

Anomalies of the Eye.—These are flecks on the iris, strabismus, chromatic asymmetry of the iris, narrow palpebral fissure, albinism, congenital cataract, and pigmentary retinitis.

Anomalies of the Ear.—Visible malformations.

Anomalies of the Limbs include polydactylism, syndactylism, ectrodactylism, phocomelus, and excessive length of the arms.

Anomalies of the Trunk are herniæ, malformation of the breasts and thorax, dwarfishness, gigantism, infantilism, femininism, masculinism, and spina bifida.

Anomalies of the Genital Organs.—Visible malformations.

Anomalies of the Skin include polysarcia, hypertrichosis, absence of hair, and premature grayness.

Physiological Stigmata.—*Anomalies of Motor Function.*—Walking late; tics; tremors; nystagmus; epilepsy.

Anomalies of Sensory Function.—Deaf-mutism; neuralgia; migraine; hyperæsthesia; anæsthesia; blindness; myopia; hypermetropia; astigmatism; hemeralopia; concentric limitation of the visual field.

Anomalies of Speech.—Mutism; defective speech; stuttering; stammering.

Anomalies of the Genitourinary Function.—Enuresis; sexual irritability; impotence; sterility.

Anomalies of the Instinct or Appetite.—Merycism; uncontrollable appetites for food, liquor, drugs, etc.

Diminished resistance to external influences and diseases.

Retardation of puberty.

Psychical Stigmata.—Insanity; idiocy; imbecility; feeble-mindedness; eccentricity; moral delinquency; sexual perversion.

REMARKS ON IDIOCY AND AMAUROTIC FAMILY IDIOCY

Feeble-mindedness and imbecility are synonyms. By these terms we mean a condition of mental impairment due to either arrested development or disease of the brain.

Pathology.—We find a number of abnormal conditions from which this usual classification is taken:

1. Cases depending upon arrested development of the whole brain or of the frontal lobes.
2. Cases associated with hydrocephalus.
3. Cases associated with microcephalus.

4. Cases associated with paralyses. There are different varieties of cerebral palsies, but the greater part are due to meningeal hæmorrhage at the time of birth. In cases due to hæmorrhage at birth there is spastic diplegia or paraplegia. Some cases are associated with acquired palsies, frequently due to meningeal hæmorrhage.

5. Some are of inflammatory origin, which follow a spinal meningitis. There may be some cases dependent on poliencephalitis.

6. Some cases are associated with epilepsy. These are due to changes in the brain caused by repeated epileptic attacks.

7. Sporadic cretins are idiotic.

Heredity, alcoholism, syphilis, family nervous diseases, other vices of parents, and intermarriage of blood relations have some relation to congenital idiocy.

Some stigmata of degeneration are found in most cases. Howe examined 517 idiots. Blindness was found in 21; deafness in 12; some defect in the nose or mouth, such as hare lip, high palatal arch, or cleft palate, in 23; some deformity of the hands or feet in 54; and paralysis of one or more limbs in 96.

Amaurotic Family Idiocy

This is a remarkable form of infantile paralysis with blindness occurring mostly in Hebrew children.

Pathology.—The cerebral convolutions are primitive in type, there are degenerative changes in the large pyramidal cells, absence of tangential fibres, and a decrease of the fibres in the white matter. The blood vessels are normal. The pyramidal columns of the cord are also degenerated.

Symptoms.—1. Psychic disturbances appearing in early life (first or second year) and progressing to total idiocy.

2. Paresis and ultimately complete paralysis of the extremities, which may be either flaccid or spastic.

3. Increased, decreased, or normal tendon reflexes.

4. Partial, followed by total blindness (macular changes, with subsequent atrophy of the optic nerve).

5. Marasmus and death, usually before the second year.

6. A distinct family type.

Occasional symptoms are nystagmus, strabismus, hyperacusis, or impairment of hearing. Sachs collected twenty-seven cases, and of these, seventeen occurred in six families. All were Hebrews.

CHAPTER XXVIII

DERMATOLOGICAL MEMORANDA

Synopsis: Introductory Remarks.—Anomalies of Pigmentation.—Diseases of the Sweat and Sebaceous Glands.—Eruptive Fevers (see Chapter on Pædiatrics).—Inflammations, Eczema, Ulceration, Phlegmon, Atrophies, etc.—Parasitic Skin Diseases, Benign and Malignant Neoplasms, Dermatoneuroses.—Diseases of the Appendages (Hair, Nails).—Formulary.

INTRODUCTORY REMARKS

The skin performs various important functions. It is endowed with the power of respiration, by means of which there is a constant, although very subordinate, interchange of oxygen and carbonic acid.

The *secretory function of the skin* is performed by the sweat and sebaceous glands. Sweating may be profuse or scanty, localized or general, or altered in color or smell. The secretion of sweat is not a continuous process, but is influenced or affected by many factors. The secretion of the sebaceous glands is probably continuous. The skin has a *vasomotor* heat regulating function which influences the radiation of heat and evaporation of moisture from the surface. The *sensory function* of the skin is a most important one. The *color* of the skin varies according to race, exposure, occupation, and the general state of health. We recognize the *habitual pallor* of indoor life and the *pallor of anæmia* from any cause. Localized or diffused *redness* may be physiological or pathological. A localized or general *cyanosis* may result from respiratory or circulatory embarrassment or from intoxication (acetanilide poisoning, etc.). *Yellow discoloration* of the skin may result from obstructive or toxæmic jaundice. A *bronzing* of the skin is associated with the so called Addison's disease. A *gray discoloration* (*argyria*) has been observed after the long continued internal administration of silver salts. The temperature of the skin may vary considerably; the whole or a portion of the integument may be warm or cold.

The skin receives the brunt of the bodily injuries and protects underlying organs and tissues. Skin diseases are due to infection and autointoxication from the gastrointestinal tract. Many skin phenomena are simply the expression of an effort to eliminate.

An unbroken skin or mucous membrane is an effective barrier to local and systemic infection by animal and vegetable microorganisms. The lymph nodes are an efficient ally in repelling microbial invasion by catching in their meshes infecting material; they generally participate also in the inflammatory and destructive processes which threaten the skin. The vulnerability of the skin from *within*, i. e., from internal conditions and causes, should always be borne in mind (*eliminative rashes*) in contradistinction to skin lesions which come from *without* the body.

The classification of skin diseases is unsatisfactory to such an extent that in some publications the group classification has been dropped and skin lesions are described in alphabetical order. Although faulty and unsatisfactory, the author gives preference to a clinical grouping of skin lesions.

As the diagnosis and management of skin diseases cannot be taught from books, however elaborate and voluminous, the definition, characteristic signs, and treatment of skin lesions are presented in *a condensed form.* At the end of the chapter a number of well tried formulæ are given, and their selection is to be accomplished by means of reference numbers.

Diet is important in skin diseases, but there are no formulated diet rules for universal application. The person afflicted with a skin lesion should avoid food which experience has shown does not agree with digestion or with the skin. Alcohol is harmful in many skin diseases; tobacco is less harmful. Climate and air have their influence, but no general rules can be laid down.

Soap and water may act as an irritant in skin lesions, particularly in eczemas, and when washing cannot be avoided a small quantity of sal soda may be dissolved in the wash water.

Dyspeptic and anæmic conditions and *constipation* should receive foremost attention, and syphilis as an underlying cause of skin lesions should not be overlooked.

DISEASES OF THE GLANDULAR APPARATUS

SWEAT GLANDS

Anidrosis.—Diminution or suppression of sweat.

1. *Primary*, due to faulty innervation.
2. *Secondary*, or symptomatic, as in diabetes, fevers, etc.

The PROGNOSIS depends upon the underlying cause.

TREATMENT.—Massage, vapor and alkaline baths, and enteroclysis may be of use.

Bromidrosis (Osmidrosis).—This is the secretion of sweat of an *offensive odor*. The cause is unknown. It may be symptomatic, as in uræmia, rheumatism, etc. It mostly occurs upon the feet of young persons. The *prognosis* is favorable.

TREATMENT.—Bathe in hot water and soap every night, and dust with talcum powder medicated with formalin (10 drops to 1 oz.).

Chromidrosis (Colored Sweat).

1. *Idiopathic*, due to obscure disorder of the sweat glands.
2. *Accidental*, due to absorption of certain substances into the system.

Green sweat is often found in copper workers.

Red sweat is caused by *Bacterium prodigiosum.*

The PROGNOSIS is bad in the first, but good in the second variety.

TREATMENT.—Removal of the cause, symptomatic management.

Hæmatidrosis (Bloody Sweat).—Hæmorrhage from the sweat pores. It occurs in hysterical women.

The PROGNOSIS is favorable.

The TREATMENT is symptomatic.

Hyperidrosis, *excessive secretion of sweat,* may be general or local. The hands, if affected, are cold and clammy. If the feet are affected, the skin is macerated and walking produces pain. It is usually due to vasomotor disturbance.

The PROGNOSIS is favorable.

TREATMENT.—See Bromidrosis; use also camphor ice and ichthyol between the toes as an ointment.

SEBACEOUS GLANDS

Acne (Pimples).

1. **Acne Albida (Milium, Grutum, Strophulus Albidus).**—The lesions are minute rounded, opaque white, seedlike grains—distended sebaceous follicles—occurring mostly on the face, the eyelids, the scrotum, and the lower surface of the penis.

The PROGNOSIS is favorable.

TREATMENT.—Puncture the little cysts, turn out the contents, and destroy the remaining cyst wall by painting with iodine.

2. **Acne Punctata (Papulosa, Atrophica, Hypertrophia, Cachecticorum, Pustulosa, Indurata).**—A pinhead to pea-sized papular and pustular eruption, mostly penetrated by a minute sebaceous plug, comedo, occurs on the forehead, face, and shoulders. It is mostly a disease of puberty, and often secondary to gastrointestinal and genitourinary disturbance or to anæmia.

PROGNOSIS.—It is a very chronic affection, giving rise to marked nodular induration.

TREATMENT.—Attention should be given to the removal of constitutional causes. Prescribe local bathing with hot water and occasionally with soap and application of formula No. 8. Puncture the pustules as they form.

3. **Acne Rosacea (Gutta Rosea).**—The nose and face are hyperæmic and greasy and traversed by irregular tortuosities of blood vessels and isolated papules and pustules. Hypertrophy of the skin is present (pseudoelephantiasis). The constitutional causes are similar to those of the preceding variety; besides, it often appears during the menopause. It may also be caused by abuse of spirituous liquors and constant exposure to the weather.

The PROGNOSIS is favorable under early and persistent treatment.

TREATMENT.—Search for and remove the constitutional causes. Locally formula No. 25 is to be applied during the day and No. 24 at night. Perform scarification of the tortuosities, if they are very marked.

Comedo (Acne Punctata Nigra, Black Heads, or Flesh Worms).—These are minute sebaceous plugs with black, yellow, or brown external points. They occur mostly on the face, neck, chest, and back. If not squeezed out, they are apt to give rise to an acnelike eruption. The *ætiology* is obscure, but is partly the same as that of acne.

PROGNOSIS.—They are very obstinate, but the outlook is favorable.

The TREATMENT is the same as in acne punctata. Locally, use formula No. 25.

Seborrhœa (Acne Sebacea; Tinea Furfuracea; Dandruff)

1. **Seborrhœa Oleosa.**—This is an inordinate oiliness of the skin of the forehead, nose, and cheeks; it is not attended by itching.

2. **Seborrhœa sicca** gives rise to an accumulation of yellow or grayish scales upon the scalp or non-hairy regions. It is attended with decided itching. When the face is involved, the eyebrows and beard are affected first. When the scalp is affected it is frequently a source of premature baldness (defluvium capillorum).

The PROGNOSIS is favorable, though the course is chronic.

TREATMENT.—In seborrhœa oleosa, use astringent lotions, e. g., formula No. 27. In seborrhœa sicca the scales are to be removed by prolonged applications of olive or castor oil, the surface is washed with green soap, and then the hair wash, No. 47, is to be used.

ANOMALIES OF PIGMENTATION

CHLOASMA; VITILIGO; LENTIGO; ALBINISMUS

Chloasma (Liver Spots, Moth).—Fawn-colored, yellowish, brownish, or blackish (*melanoderma*) patches of various sizes, irregular, rounded with fairly defined borders, may form on any part of the body. *a.* The *idiopathic*, due to external causes, may include all pigmentations resulting from local irritants, such as burns, blisters, etc., and scratching. *b.* The *symptomatic* is secondary to visceral and uterine diseases and occurs in pregnancy, Addison's disease, malarial disease, cancer, tuberculosis, etc., also from the prolonged administration of silver (argyria).

TREATMENT.—Remove the cause. Formulæ Nos. 1 and 10.

Vitiligo (leucoderma) consists of rounded, oval, or irregular, milk white or pinkish white spots, spreading slowly or rapidly, at times coalescing and forming large patches, the surrounding skin being usually brownish yellow. It is of slow progress, lasts throughout life, affects any part of the body, especially the backs of the hands and the trunk, is frequent in negroes, and may be associated with morphœa, alopecia areata, and exophthalmic goître.

TREATMENT.—Give arsenic internally, also iodine, and use weak lotions of acetic acid or corrosive sublimate locally.

Lentigo (freckles), due to an increased deposition of pigment in the basal layer of the epidermis, we observe mostly on the face and hands in individuals of fair complexion. The lesions are pinhead to pea-sized, round, oval, or irregular, and of a yellowish, brownish, or blackish color.

TREATMENT.—Use formulæ 9 or 10, and particularly 42, 43, 44, and 45.

Albinism is a lack of pigmentation.

INFLAMMATIONS

Bedsores (decubitus) are caused by undue pressure and irritating secretions with underlying constitutional or trophoneurotic changes. Pathologically they may be looked upon as local patches of moist gangrene. They are common in the course of various wasting diseases and fevers, and especially in the course of lesions of the brain and spine.

TREATMENT.—Harden the skin by means of alcohol or spirit of camphor and reduce the pressure by air cushions or a water bed. If ulcers develop, treat them antiseptically.

Ulcer of the Leg.—*Eczematous, senile, from varicose veins, syphilitic, tuberculous, carcinomatous*, etc.

PRINCIPLES OF TREATMENT OF SIMPLE ULCER.—Cleansing of the parts. Rest in bed and a lead lotion if the ulcer is inflamed. If it is not inflamed, cauterize or remove with a sharp spoon all foul granulations or débris, and dress with zinc adhesive plaster or zinc and ichthyol ointment or plain mutton suet. If the patient is obliged to be up and about, he should wear an elastic bandage over a thin summer stocking, with the toe end cut off. Almost all ulcers can be healed.

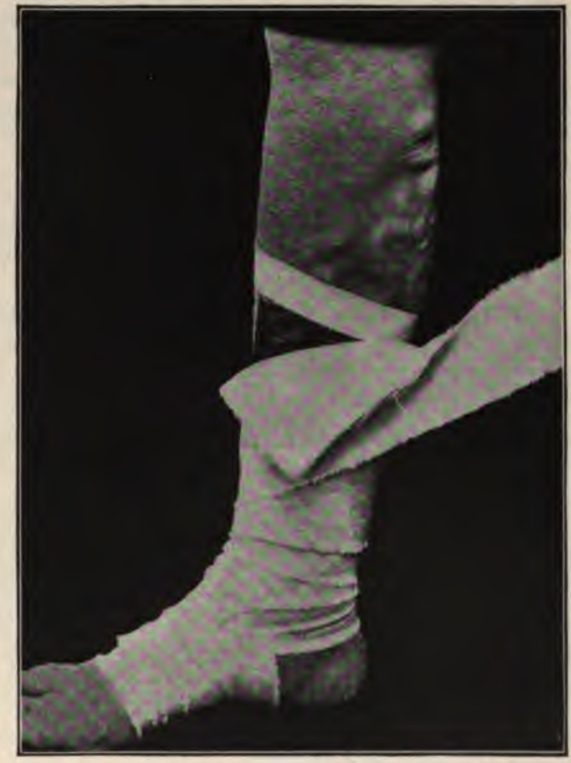


FIG. 215.—DRESSING FOR ULCER OF THE LEG.

Absorbent gauze in position over rubber tissue—roller bandage securing dressing. The gauze is turned back to show the rubber tissue beneath. (Dr. W. S. Schley, the Med. Record, 1904.)

DERMATITIS

Dermatitis calorica (burns) results from exposure to the sun (erythema or eczema solare, "sun burn"), to radiating sources of heat (x rays), or to heated solids or fluids. The degree of the burn depends upon the duration of the exposure, the degree of heat, and the resistance and sensitiveness of the skin. There is erythema, tumefaction, vesiculation, or partial or complete destruction of the skin. There may be desquamation, with consequent pigmentation or scarring. There is a tendency to severe septic complications, and in large, especially abdominal, burns ulceration of the duodenum is apt to occur, with perforation, etc. There is shock even in slight burns.

The PROGNOSIS is favorable in mild burns, but very unfavorable if more than a third of the entire body surface is affected.

TREATMENT.—Relieve pain and shock. Keep the burnt surface clean. Apply sedative lotions, powders, and ointments—carron oil, zinc and starch powder, and formulæ Nos. 21 and 36.

Congelatio (frostbite) pernio (chilblain) affects chiefly the exposed parts of the body, also the feet. Depending upon the degree of cold, the color and condition of the skin may vary from a temporary vivid hue to a dead white ("marbleized") color. There is insensitiveness, with stiffness and necrosis, the latter necessitating at times amputation of frozen fingers or toes.

The PROGNOSIS is favorable in mild and grave in severe frostbites.

TREATMENT.—Use friction with snow and towels soaked in ice water; if ulceration and gangrene set in, treat antiseptically, formula No. 37. In severe cases surgical interference may be required.

Dermatitis Gangrænosa Adultorum (Dermatitis Diabetica).—It is usually associated with diabetes mellitus. It is a bulloserpiginous form of gangrene, occurring sometimes in successive crops on the limbs. The bullæ dry in the centre into a scab enclosed by a ring of pus.

PROGNOSIS.—This depends upon the general condition of the patient, but the trouble is rarely sufficiently extensive to be fatal of itself.

TREATMENT.—Locally, use antiseptic lotions; internally roborants and attention to the underlying cause.

Dermatitis Gangrænosa Infantum (Varicella Gangrænosa, Pemphigus Gangrænosus).—This follows aggravated cases of varicella, vaccinia, or other severe pustular eruptions. It is characterized by papulopustules which dry into scabs, surrounded by narrow pustular rings and these again by bright red areolæ. They coalesce in large patches and form ulcers.

The PROGNOSIS is usually favorable, but the disease may end fatally from secondary septic infections.

TREATMENT.—Employ local antisepsis, as with lotions or salves of boric acid, and tonics internally, with enteroclysis and fresh air to breathe.

Dermatitis Medicamentosa—Drug Eruptions.—Under this title are included the several eruptions due to the ingestion and absorption of certain medicaments. Idiosyncrasy, large doses, and long continued administration are the chief factors in the production of these eruptions and other manifestations. The principal drugs, with their cutaneous results, are as follows:

Acetanilide.—Cyanosis.

Antipyrine.—Usually symmetrical erythema, mostly on the extensor surfaces.

Antitoxine.—Roseola, erythema, and occasionally urticaria.

Arsenic.—Urticarial, erysipelatoid dermatitis, or a papular rash; and in large doses, a pustular, ulcerative, or gangrenous eruption.

Belladonna.—Erythematous and scarlatiniform eruptions.

Boric Acid.—Erythema.

Borax.—Psoriasis, erythema, and eczema.

Bromine and Bromides.—Pustular, urticarial, bullous, and squamous eruptions.

Cannabis Indica.—A vesicular eruption.

Chloroform.—Purpura.

Chloral Hydrate.—Erythema and bullous and erysipelatoid eruptions.

Cod Liver Oil.—Acne and a vesicular eruption.

Copaiba.—Erythema, urticaria, or a papular eruption.

Cubebs.—A papular eruption.

Digitalis.—Erythema.

Iodine and Iodides.—Pustular, vesicular, purpuric, erythematous, and urticarial eruptions.

Iodoform.—Papular and erythematous eruptions.

Mercury.—Erythema.

Morphine.—Erythema.

Phosphoric Acid.—Purpuric and bullous eruptions.

Quinine.—Erythema and urticaria.

Rhubarb.—Hæmorrhagic and pustular eruptions.

Salicylic Acid.—Erythema, urticaria, and eczema.

Santonin.—Urticaria.

Strychnine.—Miliaria, a scarlatiniform eruption, and pruritus.

Tannin.—Urticaria.

Tar.—Erythema and acne.

Terebene and Turpentine.—Erythema and a papular eruption.

Tuberculin.—A scarlatiniform eruption.

TREATMENT.—This comprises removal of the cause and palliative treatment.

Dermatitis Multiformis Herpetiformis (Hydroa Herpetiformis).—This is manifested by a conglomeration of erythematous patches, urticarial wheals, maculopapules, vesicles, and pustules. The multiformity and changeability of the lesions, the traces of former lesions in the shape of pigmented areas, the presence of intense and persistent itching out of all proportion to that of the eruption, the frequency of exacerbations, and the extreme obstinacy of the disease are the only aids in diagnosis.

No part of the skin is exempt from this eruption.

The PROGNOSIS is not promising; the course is very chronic.

TREATMENT.—Guard against all excesses, including overwork of body and mind, and correct faulty digestion. Prescribe outdoor exercise, recreation, and tonics, formulæ Nos. 1, 2, and 19.

Dermatitis Traumatica.—This is an inflammation of the skin produced by mechanical injury, such as erosion, abrasion, contusion, compression, in fact every grade of inflammation, from simple erythema to abscess and gangrene.

TREATMENT.—Treat mild cases by a simple antiseptic dressing; in severe cases surgical interference may be required.

Dermatitis venenata is produced by the contact of chemicals, caustics, or other irritants; to the latter group belongs the dermatitis resulting from exposure to *poison ivy* (*Rhus venenata*) and *poison oak* (*Rhus toxicodendron*). Special idiosyncrasy plays a very important rôle. The disease comes on within some hours after exposure, with a sensation of heat and itching experienced in the face and hands first, and in all other portions of the body which come in contact with the affected hands next. Reddening, tumefaction, vesiculation, exudation, and severe œdema soon follow.

The PROGNOSIS is favorable; the duration is about one week.

TREATMENT.—Remove the cause, and apply cooling lotions (lead lotion) and powders, formulæ Nos. 3, 13, 32, and 35; later also ointments, formula No. 23.

ECTHYMA

The lesions are flat pustules, pea to bean-sized, first yellowish, then reddish, upon an inflamed base, with crusting, heat, pain, and burning. They are mostly distributed on the thighs, legs, shoulders, and back.

The **prognosis** is favorable.

The **treatment** is constitutional, with tonics and cleanliness. Formula No. 4.

ECZEMA (TETTER; SALT RHEUM; SCALL)

This is an acute or chronic inflammatory disease of the skin. The eruption varies with the particular variety of the affection and its situation. Hyperæmia, œdema, burning, and itching are present in all varieties. Infiltration is the chief characteristic of chronic eczema.

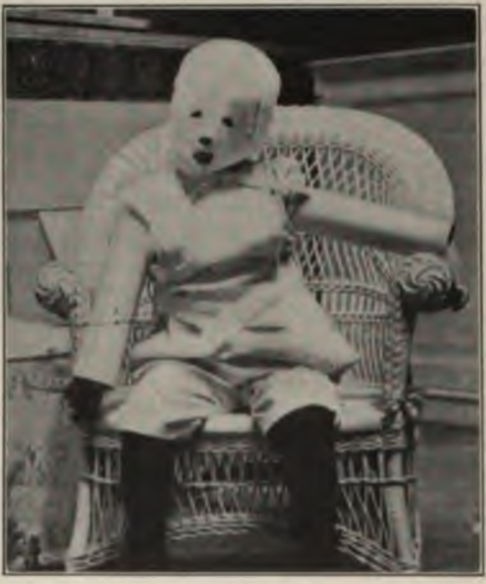


Fig. 216.—Gauze Mask and Splints to Prevent Scratching in Eczema.

Eczema Erythematosum.—There is a diffuse or circumscribed erythema of the surface, with a yellow tinge, occurring on the face and nose.

Eczema Papulosum.—The lesions are minute dull red papules on the extensor aspects of the limbs, the back of the trunk and neck, the buttocks, etc.

Eczema Vesiculosum.—Vesicles occur on the face, between the breasts, on the hands, etc., and there is exudation with yellow crusting.

Eczema pustulosum usually begins like the variety last mentioned, the fluid soon changing into pus; the lesions occur on the scalp and face.

Eczema rubrum is characterized by bright red patches and serous exudation (a "weeping surface") upon the legs of adults and the face of infants.

Eczema Squamosum.—Scaly patches are seated on an inflamed base. The course is very chronic. It occurs mostly on the outer aspects of the extremities.

Eczema fissum is marked by fissures between the fingers and toes and at the articulations.

Eczema sclerosum (keratosis) is a localized leathery infiltration occurring on the palms, soles, finger tips, etc.

Eczema Verrucosum.—There is hypertrophy of the papillæ, giving rise to a warty surface.

The prognosis varies. Some cases aid quickly in recovery; others persist for life.

TREATMENT.—*Acute Eczema.*—Cleanliness is of primary importance. Prevent scratching by masks of gauze or bandages and by means of celluloid sleeves. Reduce inflammation by lead lotion or soothing ointments. Use prescription No. 21, or mutton tallow. Give laxatives internally.

Chronic Eczema.—Remove or treat the constitutional causes, such as syphilis and intestinal toxæmia (laxatives). Soften the crusts with wet carbolic dressing (1 to 60) or oil over night. Apply stimulating ointments. Use formulæ Nos. 1, 4, 19, or soothing ointments, such as mutton suet, zinc, bismuth ointment, or stearate of zinc with acetanilide (dusting powder) or yellow oxide of mercury ointment, gr. x to ℥j. Internally, give arsenic or potassium iodide in obscure cases.

ERYTHEMA

Erythema simplex is identical with simple dermatitis (q. v.), but milder in degree.

Erythema Intertrigo (Chafing).—The skin is red, hot, moist, and macerated, and the disease may terminate in dermatitis or eczema. It occurs in regions where surfaces are in apposition, e. g., the nates, groins, axillæ, mammæ, etc.

Erythema Multiforme.—The lesions are of various sizes and shapes, consisting of macules, papules, blebs, vesicles, etc. It is mostly symmetrical. It often appears simultaneously on the backs of hands and feet. It has an acute course, with no scaling. There is some constitutional disturbance, with moderate itching. It seems to be an eliminative phenomenon in acute and chronic intestinal indigestion.

Erythema Nodosum.—Symmetrically distributed round or oval, rosy red, shining nodules, of the size of a walnut up to that of an egg, occur over the tibia, forearms, thighs, face, back, tongue, and pharynx. The duration is from seven to ten days. There is no suppuration. There are constitutional symptoms, with articular pains and swelling.

The PROGNOSIS is generally favorable.

The TREATMENT depends greatly upon the cause. Formulæ Nos. 23 and 7.

HERPES

Herpes simplex (fever blisters) consists of a small cluster of vesicles, first clear, then cloudy, which dry into crusts. They tend to coalesce, and they disappear without scar. It is situated on any portion of the face (*herpes facialis*), about the lips (*herpes labialis*), or on the prepuce of the male and the labia majora or minora of the female (*herpes progenitalis*). There are burning and itching.

Herpes Zoster (Shingles).—Groups of vesicles form on a bright red, highly inflamed base, usually along the tract of a nerve, with neuralgic pains. It is unilateral. There is a tendency to coalesce, with the formation of yellowish brown crusts. In *herpes zoster ophthalmicus* severe damage to the eye may occur.

The PROGNOSIS is generally favorable, but there is a tendency to recurrence.

TREATMENT.—Camphor ice or formulæ Nos. 3, 7, 11, or 17.

IMPETIGO

Impetigo Simplex.—There are one or more distinct yellowish pustules, of the size of a split pea, surrounded by an areola and terminating by absorption or crusting. There is no itching.

Impetigo Contagiosa.—Discrete flat superficial vesicles or blebs form, soon turning into pustules, which rupture and dry up as waferlike crusts ("stuck on"), curl up, and drop off, leaving behind reddish spots. There is a tendency to umbilication and coalescence.

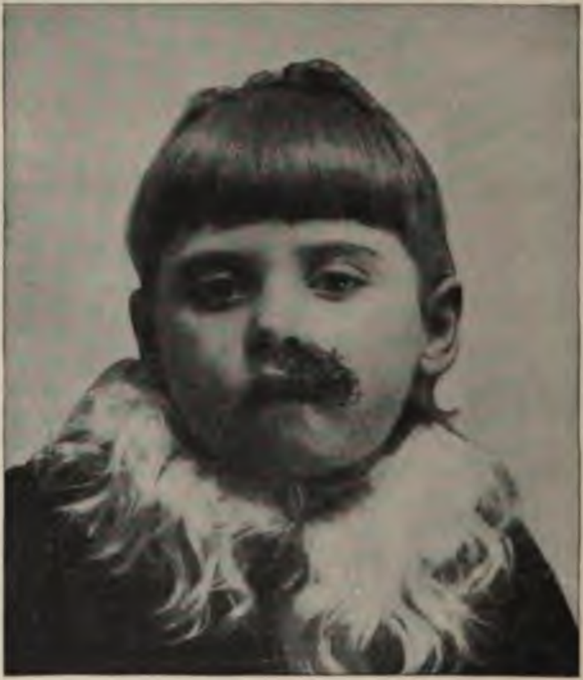


FIG. 217.—CONTAGIOUS IMPETIGO.
(By Courtesy of the Amer. Jour. of Obstetrics.)

The PROGNOSIS is favorable.

TREATMENT.—Formulæ Nos. 1, 2, 4, and 15.

ICHTHYOSIS (FISH SKIN DISEASE)

This is congenital or begins in early life. It is worse in cold weather. It often affects several members of one family.

Ichthyosis simplex involves the greater part of the body. The skin is dry and harsh with scales, either furfuraceous or large and thick, resembling fish scales.

Ichthyosis hystrix is rarer and more severe. There is papillary hypertrophy showing itself by irregular or linear corrugated, warty or spinous, horny patches.

PROGNOSIS.—The course is extremely chronic.

TREATMENT.—Use hot baths with green soap, also glycerine and formulæ Nos. 16 and 20.

LICHEN

Lichen Ruber Acuminatus.—Discrete, millet seed-sized, acuminated, scaly, reddish papules are disseminated over the trunk, with no disposition to grouping. There is severe itching.

Lichen Ruber Planus.—*First Stage.*—There are minute, reddish, irregularly shaped, sharply defined papules with flattened surface, brilliant under oblique rays of light. *Second Stage.*—Confluence of the papules occurs, forming plaques (4 mm. to 1 cm. in diameter) of a brownish red color with fine gray scales. *Third Stage.*—There is thickening of the derma, with white striation upon a red base and distinct grouping, usually upon the flexor surfaces of the forearm and wrist, the lower portion of the abdomen, the lumbar region, the lower extremities, etc., and itching.

PROGNOSIS.—The acuminate form, if neglected, may constitute a very serious disease. Lichen ruber planus is in the main benign and may undergo spontaneous cure.

TREATMENT.—Give arsenic internally, with attention to the nervous system. Locally, use tepid douches, from 95° to 100° F., to be continued from two to five minutes, also mercurial plaster or ointment. Formula No. 33.

MILIARIA (SUDAMINA; PRICKLY HEAT) STROPHULUS

This is characterized by minute red or whitish papules, of a sudden appearance, accompanied by pricking or tingling.

The **prognosis** is favorable.

Treatment.—Use cooling lotions, such as liq. plumb. subacet. dil., and formula No. 28.

PEMPHIGUS (WATER BLISTERS)

Pemphigus Simplex.—There is a successive development of crops of pea-sized to egg-sized blebs, distended with a colorless fluid, which changes to yellowish or hæmorrhagic as the eruption grows older.

Pemphigus Foliaceus.—There are flaccid and purulent blebs which rupture early, leaving an excoriated, "scalded" surface. There is a tendency to spread over the whole body, including the mucous membranes, hair, etc. It may end fatally.

Pemphigus Neonatorum.—Simplex non-syphiliticus.

Pemphigus Neonatorum Syphiliticus.—The PROGNOSIS in pemphigus simplex is favorable, while pemphigus foliaceus leads almost invariably to a fatal termination.

TREATMENT.—Use arsenic and tonics internally. Puncture the blebs and apply soothing lotions or ointments in severe cases. Prolonged immersion of the patient in a warm medicated bath may be employed, or iodide of potassium and mercury given in the specific form.

PITYRIASIS

Pityriasis Rosea (Pityriasis Maculata and Circinata).—There are patches and circles barely elevated above the surface, pale red in color, covered by very fine scales, usually on the trunk and upper segments of the limbs, with slight itching.

Pityriasis Rubra.—There is redness of the skin, with an abundance of thin, papery exfoliation. The patches are circumscribed and symmetrical and spread peripherally over the whole body. There is a tendency to marasmus.

Pityriasis rubra pilaris affects the orifices of the hair follicles, especially of the anterior surfaces of the limbs, leaving the intervening skin intact. The root of each hair is surrounded by a small, hard, conical elevation composed of minute adherent scales. The skin is dry and rough ("goose skin"), and there is slight itching.

The PROGNOSIS is favorable, but recurrences are frequent.

TREATMENT.—Use formulæ Nos. 2, 21, and 34.

PRURIGO

Prurigo Mitis.—There are circumscribed, individualized, reddish, conical papules, with minute vesicular summits, which dry up and leave behind small brownish crusts. They usually occur on the extensor surfaces of the legs and arms, on the trunk, and sometimes on the forehead. There are tingling, pricking, burning, and shooting pains, worse at night. There is a successive development of new crops.

Prurigo ferox usually begins in very early life, often following an ordinary urticaria. It may persist throughout an entire lifetime. The initial symptoms resemble those of *prurigo mitis*. The skin gradually becomes harsh, dry, hypertrophied, and pigmented, with inflammation of the neighboring glands.

The PROGNOSIS is dubious, recovery being possible, although the course is very chronic, with a tendency to be complicated by chronic eczema.

TREATMENT.—Prescribe a bland diet, and order arsenic, and pilocarpine internally. Externally, use fresh styrax ointment. Formulæ Nos. 5 and 15.

PSORIASIS (LEPRA ALPHOS)

This begins with minute white spots, usually on the elbow, knees, and scalp, gradually spreading in size and location, exhibiting incrustations of a mother of pearl-like or silvery lustre, based upon tawny red, slightly elevated patches of the skin. There is very slight itching.

Psoriasis Guttata.—There are small rounded patches, giving the skin the appearance of having been splashed with mortar.

Psoriasis Nummulata.—The eruption resembles coins of various sizes.

Psoriasis circinata is characterized by annular patches, clear in the centre.

Psoriasis Gyrata.—There are wavy lines about half an inch wide with circles and semicircles.

Psoriasis Diffusa.—The eruption is extensive and irregular, covering large surfaces.

PROGNOSIS.—It may be removed for a time by appropriate treatment, but it is almost sure to return.

TREATMENT.—Give arsenic internally. Remove the scales by warm alkaline baths. The severer the inflammation the milder the remedy, and vice versa. Formulæ Nos. 1, 4, 16, and 19.

SCLEREMA NEONATORUM

The disease develops soon after birth, showing spots of circumscribed hardness. The skin is waxy, glistening, hard, and cold; the limbs become stiff and misshapen; the temperature is subnormal; and there are weakness, somnolence, rapid breathing, and a feeble pulse.

Prognosis.—Death occurs within three or four days; rarely there is gradual recovery.

Treatment.—We may use artificial heat, massage with warm oil, and nutritious and careful feeding.

SCLERODERMA (HIDE-BOUND DISEASE)

This is a disease of the adult, characterized by pronounced stiffening or hardening of the skin, which feels like frozen skin, leather, or even wood. The hue is yellowish or brownish, and the induration is followed by atrophy. Often ankylosis of phalangeal joints (sclerodactylia) occurs. If it remains circumscribed in form, it is known as *morphœa;* the latter may manifest itself as atrophic pitlike depressions in the skin and as lines, streaks, and telangiectasis.

Prognosis.—It may undergo spontaneous involution or persist throughout life.

Treatment.—Use tonics internally, massage with warm oil, and employ electricity locally.

URTICARIA (HIVES; NETTLE RASH)

There is a sudden appearance upon any portion of the body, as well as a sudden disappearance, of "wheals" of a whitish, pinkish, or reddish color, accompanied by stinging, pricking, and tingling, and with slight constitutional symptoms.

Urticaria annularis occurs in rings.

Urticaria figurata occurs in spirals.

Urticaria vesiculosa shows vesicles on the summit of the wheal.

Urticaria bullosa shows a bullous development on the summit of the wheal.

Urticaria Papulosa.—The wheal is combined with a papule.

Urticaria tuberosa is manifested by giant wheals.

Urticaria hæmorrhagica is a combination of urticaria with purpura.

Urticaria pigmentosa is marked by pigmentation following the wheals.

Urticaria Chronica Infantum.—See Strophulus.

The PROGNOSIS for urticaria is favorable, but recurrences are frequent.

TREATMENT FOR URTICARIA.—Correct faulty digestion with an aloin pill at night and 5 gtt. of hydrochloric acid after eating. Externally, use formula No. 5 or 32.

XERODERMA (XEROSIS)

There are congenital dryness, harshness, and roughness of the skin, with scaly desquamation and dull, grayish, dirt-colored discoloration, chiefly involving the temples and extremities. It appears usually within the first two years of life.

The **prognosis** is unfavorable.

The **treatment** is palliative.

PARASITIC SKIN DISEASES

A. ANIMAL

Pediculosis (lousiness).

Pediculosis capitis occurs mostly on the occipital portion of the head, with the presence of ova, or nits, and pediculi; there is itching, with consequent scratch marks.

Pediculosis corporis occurs mostly on the scapular region, chest, abdomen, hips, and thighs. There are red dots, pustules, itching, and scratch marks, with pigmentation. Pediculi may be found on the body and in the clothes.

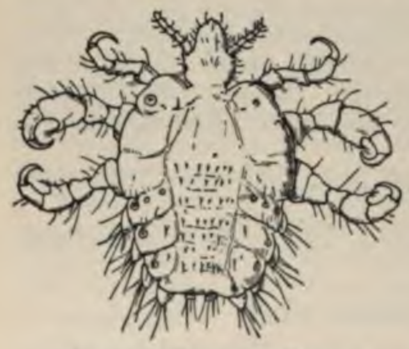


FIG. 218.—PEDICULUS PUBIS.

Pediculosis pubis (crab louse) infests the pubes, axilla, sternal region, beard, eyebrows, and lashes. There is a pruriginous eruption.

The PROGNOSIS is favorable.

TREATMENT.—Scrub the parts with hot water and green soap, and apply formulæ Nos. 15, 20, 22, and 38 or petroleum.

Scabies (Itch).—There are whitish or yellowish dotted, linear elevations (burrows) of the epidermis, produced by the burrowing process of the parasite, the *Acarus* or *Sarcoptes scabiei*, which can be discovered microscopically. There are papules, vesicles, and pustules, with excoriations and scratch marks. There is violent itching, worse at night. It chiefly affects the hands, the sides of the fingers and the folds between them, the wrists, the mammæ, the nipples, and the penis.

The PROGNOSIS is favorable.

TREATMENT.—Scrub the parts with green soap and hot water, and apply formula No. 19 or 22 or tincture of iodine.

B. VEGETABLE

1. *Blastomycetæ (Yeast Fungi)*

Skin actinomycosis, due to the actinomyces, or ray fungus, is characterized by tumors along the sides of the face and lower jaw, which are livid and later dark in color; they rupture and discharge sulphur—yellow, sagolike particles composed of masses of the parasite. There are constitutional symptoms.

The PROGNOSIS is favorable if the affected parts can be reached and removed perfectly. It may result fatally if *internal* organs are involved.

TREATMENT.—Destroy localized foci by surgical methods, scarification, cauterization, actual cautery.

Mycetoma (Madura Foot).—A single papule or pustule occurs on the sole of the foot or on a toe or finger, which enlarges and breaks; similar lesions gradually involve the entire limb, leaving behind sinuses which discharge yellow or black masses, resembling fish roe, which contain the fungus.

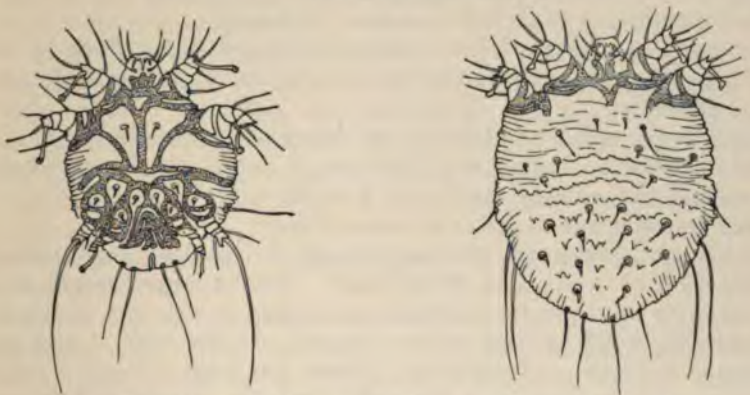


FIG. 219.—MALE AND FEMALE OF SARCOPTES SCABIEI (Braun).

The PROGNOSIS is favorable as to life, but the disease is very tedious and distressing.

TREATMENT.—Surgical methods, such as cauterization, must be used.

2. *Hypomycetæ* (*Mould Fungi*)

Alopecia areata parasitica (see Alopecia).

Myringomycosis (Fungous Disease of the External Ear).—This is due to *Aspergillus glaucus* and *niger*. The middle and external meatuses of the ear are covered by a substance resembling dirty blotting paper, with small raised spots of a black, brown, green, or yellow color. The eruption is often glazed by a serous exudation. There are pain, stinging, and itching, and partial or complete deafness may result if the disease is neglected.

The PROGNOSIS is generally good, but there is a tendency to relapse.

TREATMENT.—Use parasiticides. Syringe with soap water and formalin water.

Tinea trichophytina (ringworm) is due to a trichophyton fungus.

Tinea Barbæ (Sycosis).—There are scaly patches on the bearded surface, soon developing into numerous pustules and tubercles. The hairs become loose and brittle, and there are itching, burning, and pain.

Tinea Capitis (Tonsurans).—There are circumscribed ring-shaped, slightly raised patches, reddish, grayish, or greenish yellow in color. The hairs are loose or broken off close to the scalp, and there is rapid spreading of the patches. Soon baldness of the affected spots occurs (see Alopecia). At times it is accompanied by severe local inflammation with exudation of a viscid gelatinous secretion (tinea kerion). There is itching.

Tinea Corporis (Circinata).—There occur small, circular scaly spots which spread rapidly peripherally and become clear in the centre, often attaining half an inch in diameter. Occasionally the "rings" coalesce, forming serpiginous lesions. The face, trunk, thighs (tinea circinata cruris), axilla, and nails (tinea unguium) are chiefly affected.

The PROGNOSIS is good, but the course is chronic.

TREATMENT.—*Tinea Barbæ.*—Wash the face with hot boric or carbolic acid solution, and apply formula No. 1, 4, or 37, or, if the spots are dry, tincture of iodine.

Tinea Tonsurans.—Formula No. 29, followed by formula No. 6.

Tinea Circinata.—Paint with tincture of iodine or glacial acetic acid every second day or use formula No. 1 or 15.

Tinea favosa is due to *Achorion Schoenleinii.*

First stage: There are itching, redness of the skin, and furfuraceous desquamation of the cuticle of the scalp. Second stage: Small, isolated, dry, yellowish crusts form, gradually increasing in size and thickness and becoming depressed in the centre, forming "favus cups," and there is looseness of the hair. Third stage: There are large, irregular yellow incrustations with baldness (see Alopecia), and the remaining hair becomes woolly. Fourth stage: The crusts become white, friable, and uneven, resembling pieces of crumbling mortar; there is a fœtid "mousy" odor.

The PROGNOSIS is doubtful.

TREATMENT.—Formula No. 29 followed by formula No. 6.

Tinea Versicolor (Liver Spots) Due to Microsporon Furfur.—There are irregular spots, of the size of a small coin to that of a hand, variously colored, from delicate buff to deep brown, mostly on the chest, covered with furfuraceous scales. The disease has erroneously been attributed to derangement of the liver.

The PROGNOSIS is good.

TREATMENT.—Apply formula No. 1 or 15 or tincture of iodine.

Schizomycetæ (Fission Fungi, Bacilli, and Cocci)

Anthrax (malignant pustule) is due to *Bacillus anthracis.* A red pimple, like an insect bite, forms and is soon converted into a vesicle surrounded by red, brawny infiltration; around this there is a ring of secondary vesicles. There are severe induration, œdema, implication of neighboring glands, and constitutional symptoms.

The PROGNOSIS is unfavorable without early energetic treatment.

TREATMENT.—Use germicides externally and roborants internally. Surgical interference may be required.

Carbunculus (Carbuncle).—There is a large, flat infiltration, from the size of a chestnut to that of an orange, usually on the neck or back, followed within a week by sloughing and exudation of sanious pus. There is a cribriform appearance of the surface, and there are constitutional symptoms.

The PROGNOSIS is generally good, if the disease is treated early.

TREATMENT.—Surgical interference should be resorted to—early deep incisions and a moist antiseptic dressing.

Elephantiasis (E. Arabum, Barbadoes Leg, Pachydermia).—This usually affects the leg and foot, also the genitalia. It begins as an erysipelatous inflammation, with fever, lymphangeitis, pain, etc., followed by a more or less permanent enlargement of the part. There are frequent recurrences of these attacks until a state of chronic hypertrophy is reached. Pigmentation, fissures, and papillomatous growths form.

The PROGNOSIS is unfavorable.

The TREATMENT is palliative.

Erysipelas (the Rose).—This is due to *Streptococcus erysipelatosus*. Red spots form, rapidly spreading and coalescing, with œdema. The skin is tense and shining; at times there are also small vesicles and blebs, with constitutional disturbance, such as fever and delirium.

ERYSIPELAS (PHLEGMONOUS).—In this form there is infiltration of the areolar tissue.

ERYSIPELAS AMBULANS.—This is characterized by involvement of different portions of the body.

The PROGNOSIS for erysipelas is uncertain.

TREATMENT.—Give iron internally, 5 gtt. of tinct. ferri chloridi every two hours. Use a lead lotion externally or formula No. 21. Limit the spreading by demarcating the affected part by means of the nitrate of silver stick or superficial scarifications (fence rail) and a moist bichloride dressing.

Furunculus (Boil).—Small, hard, rounded, reddish spots form, painful on pressure, developing within a week into a painful inflammatory swelling with a central suppurating and necrotic point, the "core." The pain is dull and throbbing. There are slight constitutional symptoms.

The PROGNOSIS is favorable.

TREATMENT.—First apply a moist dressing of hot tea leaves, then make an incision and apply a surgical dressing.

Glanders (Farcy).—Due to the bacillus of glanders. It is a disease of horses, transmitted to man. There are small nodules which soon soften and break down, discharging a viscid grayish yellow or hæmorrhagic material. The edges of the "bud" are swollen, ragged, and ulcerated, and enclose a craterlike base which is at times studded with tubercles. Secondary abscesses form, and there are severe constitutional symptoms. Often there are respiratory lesions, with nasal ulceration and a foul smelling discharge.

The PROGNOSIS is grave.

The TREATMENT is surgical. Give dilute Hcl and tonics internally.

Leprosy (Lepra Vera; Black Leprosy).—Due to the lepra bacillus.

LEPROSY, TUBERCULAR FORM.—*First Stage.*—There are depression, debility, drowsiness, chilliness, profuse sweating, vertigo, and recurrent epistaxis, with a high temperature.

Second Stage.—After days or months, there are œdema of the eyelids, erythema of the face, ears, and extremities, and well defined shiny, slightly raised patches. This is followed by crops of papules, reaching the size of a hen's egg, yellowish or brown in color.

Third Stage.—There are tubercular nodules on the face, limbs, breast, etc., also on the mucous membranes. A characteristic leonine expression of the face occurs as a result of hypertrophy. There is gradual ulceration of the skin with severe constitutional symptoms and exhaustion, and death occurs in from eight to ten years.

Leprosy, Non-Tubercular (Anæsthetic Form).—*First Stage.*—The prodromes are similar to those of the other variety.

Second Stage.—After about a year, pale yellow, flat spots, one or two inches in diameter, appear on the back, the shoulders, the posterior aspect of the arms, the nails, and the thighs, sometimes along the course of nerves. The eruption spreads peripherally, clears in the centre, and becomes dry, scaly, and anæsthetic. Atrophic changes follow.

Third Stage.—Paralyses, ulceration, gangrene, loss of members by resorption of bone, marasmus, and death occurs within from fifteen to twenty years.

Leprosy, mixed tubercular form, is a combination of both former varieties. Often there is destruction of cartilages of the nose and soft palate.

The prognosis for leprosy is grave.

The treatment is palliative. Give tonics, attend to the hygiene, and allow nutritious food. Good results are reported from chalmougra oil used internally and externally.

Lupus.—*Lupus Erythematosus* (see Benign Neoplasms).

Lupus Vulgaris (see Tuberculosis of the Skin).

Moluscum Contagiosum.—Discrete, semiglobular, waxy white, umbilicated elevations, of the size of a split pea, containing a cheesy substance form, especially on the face, eyelids, hands, and neck.

The prognosis is favorable.

Treatment.—Squeeze out the contents. Formulæ Nos. 1, 4.

Rhinoscleroma.—This is characterized by the formation of flat, discrete or coalescent, hard, ivorylike plaques, deeply embedded in the mucous membrane or skin and sharply bounded from the adjacent healthy parts. The surface is reddish, smooth, and crossed by dilated blood vessels. Usually it affects the alæ nasi first, and then spreads upward into the anterior and posterior nares. It may affect also other portions of the nasopharynx or the larynx.

Prognosis.—The growth never breaks down spontaneously.

Treatment.—Employ curetting, excision, and the galvanocautery.

Syphilis of the Skin.—*Primary Stage.*—After an incubation period of from three to four weeks, a small grayish papule—chancre—develops which is depressed in the centre, indurated at the base, and covered by epithelial débris or a scanty secretion. There is involvement of the neighboring glands.

Secondary Stage.—After from six weeks to six months, there appear a number of different forms of eruptions resembling roseola, eczema, acne, psoriasis, lichen, pemphigus, tuberculosis cutis, condylomata, rupia, ecthyma, etc. These eruptions are modified in syphilis by their coppery, or "raw ham," color, the presence of more or less pigmentation, their symmetrical arrangement, the circular or crescentic shape of the patches, absence of itching, absence of large and silvery scales, as seen in ordinary psoriasis, the predilection for certain localities, such as the chest, abdomen, between the shoulders, back of the neck, forehead, roots of the hairs, and the palms and soles and flexor aspects of the limbs, and finally their polymorphism, the eruption being here papular and there pustular, etc. There are also

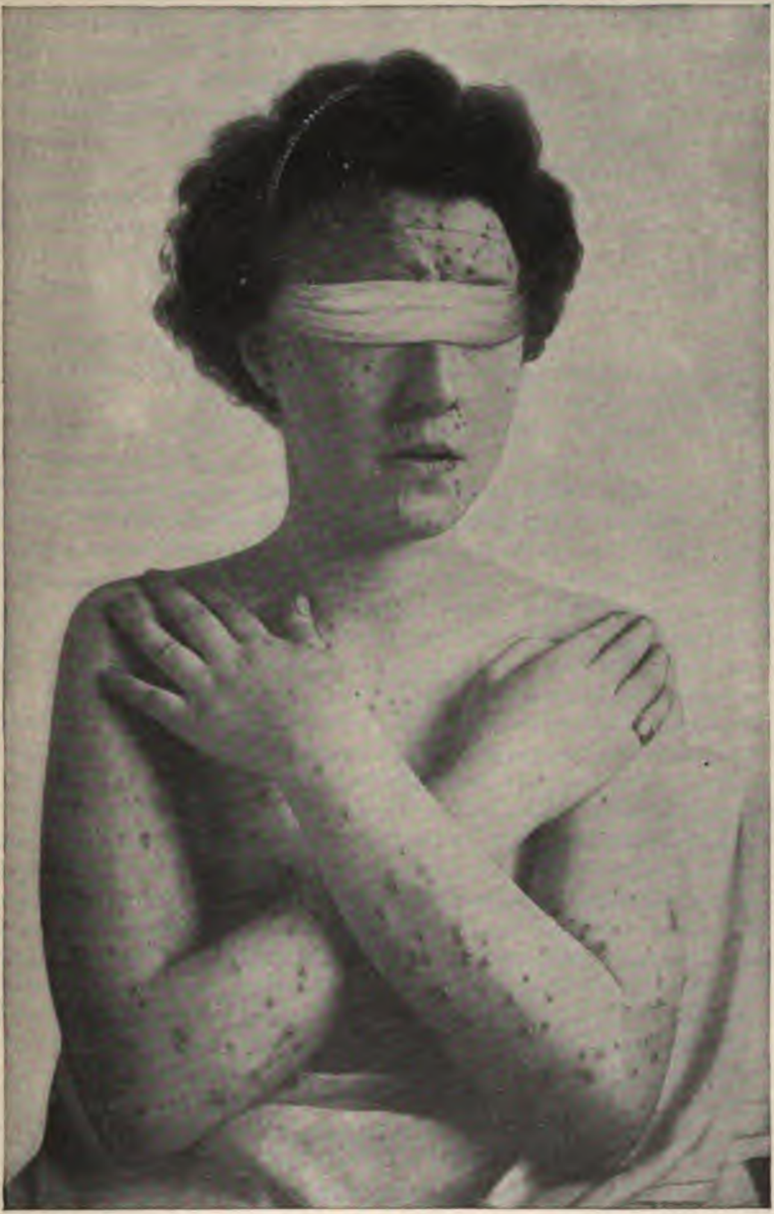


FIG. 220.—PAPULO-PUSTULAR SYPHILIDE SENT TO MUNICIPAL HOSPITAL AS A CASE OF SMALLPOX. (After Welch and Schamberg.)

suppurative and deep ulcerating patches on the mucous membranes. The iris, periosteum, bones, joints, ear, and testicles may successively or simultaneously become affected. There is marked involvement of the lymphatic glands. Syphilitic alopecia or onychia may occur. There are constitutional disturbances, especially headache at night, with prostration.

Tertiary Stage.—This follows after a few months or years. Gummata may form in any structure or organ of the body, which may undergo caseation or necrosis, continue indefinitely, or be absorbed under appropriate treatment; they may give rise to deformities, as when attacking the nasopharynx, and to disturbances of the respiratory, circulatory, digestive, and nervous systems, the manifestations depending upon the locality and extent of the syphilitic lesion.

The PROGNOSIS is favorable if the disease is treated early and energetically.

TREATMENT.—Use mercury in the primary and secondary stages, and the iodides and mercury in the tertiary stage (see Syphilis).

Tuberculosis of the Skin.

LUPUS VULGARIS.—Minute soft papules like apple jelly form mostly upon the face, nose, cheeks, and ears, developing gradually into nodules or tubercles which coalesce and form dull red, raised, soft patches. It develops usually before puberty. There is little or no pain. The patches may disappear by absorption, leaving a scarred, scaly, and atrophic skin (*lupus exfoliativus*), or may ulcerate and leave crusts and cicatrices (*lupus exedens, exulcerans*), and if the crusts are removed, the base is found covered by granulations and bleeding freely; or exuberant granulations may appear upon the borders of the ulcers (*lupus hypertrophicus*), or, again, the patches may develop in papillomatous outgrowths (*lupus papillomatosus*).

The *prognosis* is favorable.

Treatment.—Use the actual cautery, tuberculin, x rays, Finnsen light, and radium.

MILIARY TUBERCULOSIS.—The lesions are situated at the junction of mucous membrane and skin, at the entrance of the mouth, nose, vagina, and anus. There appear shallow ulcers with jagged, indented, "gnawed out" edges; the floor is covered by a viscid secretion and at times studded with yellowish elevations, miliary tubercles. It is extremely painful. It is usually associated with tuberculous disease of the internal organs.

The *prognosis* is uncertain.

Treatment.—Hygienic management and cauterization with glacial acetic or trichloracetic acid should be employed.

SCROFULODERMA.—At the outset the lesions appear usually on the face and neck as soft circumscribed infiltrations of the deeper tissues, over which the skin is freely movable; later the skin becomes involved, being hyperæmic or bluish in color; the nodules soften and break down, forming ulcers with undermined edges, a soft bleeding floor, and fistulous tracts. Secondary infection occurs. The lesions are in the beginning neither tender nor painful.

The *prognosis* is uncertain.

Treatment.—Attend to the general hygiene, and use local cleanliness and camphor ice, iodide of potassium, if syphilis is suspected as the underlying cause. Iron or arsenic in anæmic children.

TUBERCULOSIS VERRUCOSA (*Anatomical Wart*).—This is due to direct local tuberculous infection (dissecting room infection).

Inflammatory.—A growing plaque forms, covered with crusts in the centre, surrounded by a zone of pustules and this again by a bright erythematous zone. Between the warty excrescences there are fissures from which pus may be squeezed out.

Non-Inflammatory.—There is a soft tubercle with a tendency to papillary hypertrophy of its surface; the pustular and erythematous zones are wanting.

Both varieties affect mostly the hands or other exposed portions of the body.

The *prognosis* is favorable. The warts rarely ulcerate, but may disappear by absorption.

Treatment.—Employ incision, cauterization, Peruvian balsam, and a bichloride of mercury lotion (see formulary).

Yaws (Frambœsia).—This is a tropical contagious disease of the skin characterized by dirty or bright red raspberrylike tubercles which appear usually upon the face, toes, and genitalia. It is most frequently seen in young colored persons.

The PROGNOSIS is unfavorable and the course is very chronic.

TREATMENT.—Resort to incision, cauterization, Peruvian balsam, and a bichloride of mercury lotion (see formulary).

NEOPLASMS; NEW GROWTHS

I. BENIGN

Adenoma Sebaceum.—There are small, round, convex tumors, from a pin's point to a split pea in size, reddish, brown, waxy, or normal in color, occurring mostly on the face, on either side of the nose, associated with a coarse skin and comedos.

Angeioma (Vascular Tumor).

ANGEIOMA, SIMPLE.—A small, violet or red, slightly elevated tumor appears usually on the face or neck, but also on other portions of the body. It is often congenital. The *treatment* is by excision or the actual cautery.

ANGEIOMA CAVERNOUS is a soft, doughy, non-pulsating tumor, leaden or blue in color, situated mostly near a mucous surface.

The *treatment* is surgical. Excision or actual cautery.

ANGEIOMA TELANGIECTATIC has its surface often covered with small granular elevations resembling a strawberry, varying in size from that of a millet seed to several inches in extent.

The *treatment* is by excision or the actual cautery.

Angeiokeratoma.—Warty growths occur over dilated vessels, usually on the dorsal surfaces of the fingers and toes. They are worse during cold weather and sometimes bleed freely. There may be successive attacks of chilblains.

The *treatment* is by excision or the actual cautery.

Cicatrix (Scar).—*Flat, or Normal.*—Situated at about the level of the normal skin.

Atrophic.—Lies below the skin's level in the form of contracted depressed areas.

Hypertrophic.—Projects above the surface; may be elongated, rounded, star-shaped, or in the form of a network.

The TREATMENT is by excision.

Clavus (Corn).—This is a local induration and thickening of the skin from pressure and friction. It is usually found on the dorsal surfaces of the phalanges, on the outer surfaces of the little toes, and also between the toes ("soft" corn).

TREATMENT.—Soften the corn in hot soap suds, trim the hypertrophied layer, and apply glacial acetic or nitric acid. Formula No. 31.

Bunion.—This is a swelling formed by an enlarged, thickened, and inflamed bursa and skin over the inner side of the metatarsophalangeal joint of the great toe, mostly due to the constant wearing of short and narrow pointed shoes.

TREATMENT.—Insistence upon the patient's wearing a shoe with rounded toes, with a cotton pledget between the first and second toes, or drawing the phalanx inward by strapping or some mechanical device to avoid pressure.

To subdue *inflammation*, rest, elevation of the foot, and the application of cold lead lotion or hot foot baths are to be employed. The indurated cuticle may be trimmed down with a sharp knife.

Suppuration and *ulceration* may necessitate *incision*, curettage, and osteotomy of the head of the bone or thorough removal of the inner condyle. Examine with the x rays.

Cystoma, Sebaceous.—This is a tumor of various size, firm or soft, round (if the sebaceous duct is obliterated) or flat (if the duct is open). It may be single or multiple, and is freely movable under the skin. The skin is normal or white, but red if inflamed. The scalp, face, back, and scrotum are favorite localities.

Hydrocystoma (Cyst of the Sweat Glands).—The tumor consists of tense, transparent, shining, obtuse, round or oval vesicles, from a pinhead to a pea in size, usually on the face of middle aged women who perspire freely and are exposed to heat, especially laundresses. It is a disease of the summer and disappears in the winter. The vesicles dry up without rupturing.

Fibroma (hyperplasia of the **connective tissue,** the fibrous portion predominating).

Fibroma, Simple.—A hard tumor, usually single, appears upon the trunk or one of the extremities, either sharply defined or merging gradually into the normal tissue, and movable with the skin.

The TREATMENT is surgical.

Fibroma Molluscum.—Multiple indolent tumors form, either buried in the skin or projecting and pedunculated, variously colored, rounded, flattened, or pulled out, often capable of invagination, so that the sensation of dipping into a pouch is received by the examining finger. They occur mostly on the anterior portion of the trunk, also on the head, etc.

The TREATMENT is surgical.

Keloid.—This is a scarlike fibrous tumor, movable with the skin, arising from preexisting scar tissue or an inflammatory exudation. It is single or multiple. It occurs mostly on the sternal region, and the growths are arranged in parallel rows if they are multiple. The tumor appears elevated, sharply bounded, or flat and cake-shaped; either firm or elastic, glistening white or red. The surface is smooth and usually without hairs. It is painful on pressure.

The TREATMENT is surgical.

Lipoma (Fatty Tumor).—This is a soft, lobulated, circumscribed or diffuse tumor of varying size, surrounded by a loosely attached separate capsule, mostly on the neck, back, and nates.

TREATMENT.—Removal if it is indicated.

Lupus Erythematosus.—This takes the form of one or more rounded or oval spots, gradually increasing in size, either peripherally or by coalescence, from that of a small coin to that of the palm of the hand. The spots are sharply marginate and reddish or violaceous in color. The surface is covered by grayish or yellowish scales. The border is somewhat elevated and the central portion depressed. There is whitish atrophic scarring, with some itching and burning. It occurs mostly on the face. Its course is very chronic. Occasionally it undergoes involution.

TREATMENT.—In the early stages: Formula No. 1, 4, or 15. In the later stages: Glacial acetic acid every other day until three applications are made and until the affected skin is thoroughly destroyed. Then use formulæ Nos. 15 and 21.

Lymphangeioma.—Small deeply seated vesicles appear in closely aggregated clusters. The epidermis covering them is firm and warty. The vesicles, if pricked, exude a clear, colorless liquid, lymph. There is a tendency to recurrent inflammation.

The TREATMENT is surgical if any.

Myoma (Tumor composed of newly formed **muscle tissue)**, single or multiple.

TREATMENT.—Removal if indicated.

Neuroma (Tumor Composed of **Nerve Tissue)**. Several small tumors occur along nerve trunks or scattered over the body.

TREATMENT.—Removal if indicated.

Nævus (Birth Mark, Mole).

NÆVUS PIGMENTOSUS.—This is usually congenital and characterized by a pigmentary deposit, with or without hypertrophy of the skin.

NÆVUS SPILLUS is smooth, flat, pigmented, and devoid of hair.

NÆVUS PILOSUS is like the last mentioned variety, but covered with hair.

NÆVUS VERRUCOSUS has an irregular or wartlike surface.

NÆVUS LIPOMATOSUS is elevated, with connective tissue and fat hypertrophy.

NÆVUS VASCULOSUS is either congenital or developing soon after birth. It is due to dilatation and new growth of the cutaneous capillaries. They become pale or disappear on firm pressure.

NÆVUS FLAMMEUS (PORT WINE MARK) appears on one side of face or on other parts of the body. There are diffuse, flat or slightly raised patches, bright red in color. The surface is smooth or irregular.

NÆVUS ARANEUS (SPIDER CANCER) shows a small central red point, with projecting dilated vessels on all sides, like a star.

NÆVUS CAVERNOSUS.—There are prominent tumors of varying size, smooth or lobulated, sometimes pulsatile, soft, and easily compressible.

TREATMENT OF NÆVUS.—The actual cautery, excision, and electrolysis.

The apparatus necessary for electrolysis consists of a number of galvanic cells and a galvanometer. To the positive pole are attached a number of gold or platinum needles. The negative electrode is a large metal plate covered with chamois skin, which is placed near the field of operation. The current is applied slowly, and the needles may be introduced to any desired depth, about one inch apart. From 10 to 30 milliampères are used. After the operation a moist antiseptic dressing is applied. The sittings are repeated once a week or once in two weeks.

Papilloma (Hypertrophied Papillæ of the Skin).—It is hard if on the skin, and soft if on a mucous membrane. It usually consists of secondary outgrowths from some chronic inflammatory affection where the granulations have become hypertrophied and vegetating.

TREATMENT.—Removal if indicated.

Verruca (Wart).

VERRUCA VULGARIS occurs mostly in children, upon the head, face, hands, and ears, and is single or multiple. There are small, hard, sessile, conical elevations, with a flat top. It seems to be contagious and autoinoculable. It may disappear spontaneously.

VERRUCA PLANA.—The lesions are smaller than in verruca vulgaris, but greater in number. It may be situated on any portion of the body. The warts are often grouped on the cheeks and forehead. It occurs mostly in young persons.

VERRUCA SENILIS usually occurs in persons over fifty years of age, on the back, arms, face, neck, and trunk. The warts are often of a greasy consistence and the seat of pruritus, and may end in epithelioma.

VERRUCA FILIFORMIS.—There are small threadlike growths, mostly on the eyelids, neck, and chest, in adults.

VERRUCA DIGITATA is characterized by small threadlike growths separated at the base, multiple, occurring on the scalp, etc.

VERRUCA ACUMINATA.—The lesions are closely aggregated, sessile or pedunculated, and may resemble mulberries; they occur mostly on the genitalia. In pregnant women they are apt to increase rapidly and then disappear spontaneously after parturition.

VERRUCA SYPHILITICA (CONDYLOMA) is mostly a secondary symptom of syphilis, but may also play the part of primary syphilis. It may affect exposed situations or occupy some cleft. In the one case it will be an ashy gray, dry wart, hard and rasplike to the touch; in the other, composed of semitransparent, pink, moist, ill smelling fungous granulations. It may be sessile or pedunculated.

TREATMENT.—Removal by ligature, excision, or different caustics. Take 15 grains of corrosive sublimate and dissolve in 1 ounce of collodion. Brush the warts carefully once a day with this solution. Also specific constitutional treatment.

Xanthoma.

Xanthoma Planum.—There are flat, sharply bounded, soft patches or plates, of a dull yellow color, usually on the eyelids.

Xanthoma Tuberosum.—There are raised soft nodules, in size from that of a pea to that of a small orange, on the extensor surfaces of the limbs, fingers, toes, knees, palms, and soles. At times it involves mucous membranes. It is of a dull yellow color, at times associated with jaundice.

Xanthoma Diabeticorum.—There are firm raised nodules, round or oval, chiefly red, with the apex yellow, associated with diabetes mellitus. It is of rapid development and often undergoes involution without leaving scars.

Treatment.—Removal if necessary.

MALIGNANT NEOPLASMS

Carcinoma Cutis (Epithelioma).

Carcinoma lenticulare is usually secondary near a cancerous cicatrix. There are white or reddish papules, with a smooth glistening surface. It advances by gradual growth and infiltration and often ends in ulceration. Metastasis and cachexia occur.

Carcinoma tuberosum may be either primary or secondary. There are firm papules, nodules, and tubercles, deeply seated, discrete, or confluent. Ulceration and metastasis occur.

Carcinoma pigmentosum arises from moles, forming hard and soft elastic nodules of different colors. They may remain stationary for some time, or metastasis may take place to internal organs, with rapid marasmus and death.

Epithelioma (Epithelial Cancer, Rodent Ulcer).—This occurs mostly on the face, lower lip, tongue, eyelids, and genitalia.

Epithelioma Superficiale (Discoid).—There are flat, yellowish or reddish patches, with a tendency to excoriation and crusting. After months or years the lesions increase in number and there is a formation of round ulcers with sharply indurated, pearly edges and hard, uneven, bleeding base, secreting a scanty yellowish fluid. There is slight pain, but there are no constitutional symptoms.

Epithelioma, deep seated (nodular), may occur secondarily to the superficial form or primarily, beginning with a firm, indurated, shiny reddish or purplish nodule, varying in size from that of a pea to that of a walnut, terminating within a few months in a deep, uneven ulcer with an easily bleeding base and hard, everted, purplish edges. There is severe pain, with constitutional symptoms.

Epithelioma (papillary) may follow the other varieties or develop from an ordinary wart; it may appear as a small verrucous elevation or as a large, lobulated, spongy, papillary growth. The surface is dry or moist and covered with exuberant granulations. Disintegration occurs, with the formation of fissures and ulcers.

Treatment of Epithelioma and Carcinoma.—Excision or by caustics. Exposure to x rays, Finnsen light, radium. Formulæ Nos. 40 and 41.

The use of caustics in the radical treatment of carcinoma has a limited field of usefulness. Cutaneous cancers are usually *treated* more satisfactorily by escharotics than by any other method. Caustic agents should be applied in such a manner as to produce the requisite effects by a single application, otherwise the irritation gives, not necessarily, but commonly, new activity to the disease.

Mycosis Fungoides (Granuloma Fungoides).—*First Stage.*—There are rounded, oval or crescentic, sharply bounded patches, bright red in color, on the trunk, limbs, and face. It resembles eczema, erythema, or urticaria. Severe itching may come and go for a period of years before the disease reaches the *second stage*, which is characterized by infiltration of the plaques, a new development of papules, and hard round, pale nodules. It may persist or disappear and leave pigmentation or superficial atrophy. *Third stage:* There is the development of red, violaceous, shining tumors resembling tomatoes of various sizes. It may either follow the first or second stage or appear suddenly. It may disappear spontaneously or ulcerate, break down, and cause marasmus and death. There is usually no involvement of the glandular system.

The TREATMENT is hygienic, surgical, and by cauterization.

Paget's Disease of the Nipple.—This occurs mostly in women between forty and fifty years old. It begins as an inflammation of the skin of the nipple and areola of one breast, resembling eczema. The surface of the plaque is bright red, circinate, oozing in places, or covered with crusts and scales; later on, irregular, confluent, dry, glazed islets of epidermis are seen scattered over the excoriated surface. There are induration and retraction of the nipple, with pain and itching. The duration is from two to seven years.

The TREATMENT is surgical.

Sarcoma.—SARCOMA, PRIMARY, non-pigmented, single, develops at the site of a cicatrix or nævus or in or beneath normal skin. It may remain stationary for years, then enlarge and infiltrate the skin and internal organs, and produce general sarcomatosis. It differs from carcinoma in its softer consistence and its greater tendency to assume a peculiar configuration, such as toadstool and pedunculated forms.

SARCOMA, GENERAL CUTANEOUS, may follow the primary variety or sarcoma of the internal organs and affect the whole integument. It may end fatally very rapidly.

SARCOMA, MELANOTIC, may be primary on the skin or secondary to a tumor of an internal organ. The starting point is a pigmented nævus or other pigmented lesion, such, for instance, as chloasma or a stain of purpura. The tumor is rounded, nodular, brownish or black, and varying in size and consistence. It is very malignant and rapidly fatal.

SARCOMA, MULTIPLE, IDIOPATHIC, PIGMENTED.—This usually begins on the hand or foot, rapidly advancing upward upon the arm or leg to the trunk and face. The tumor is firm, reddish brown or purple, as large as a pea or a bean; it may undergo partial or complete involution, leaving a pigmented cicatrix. The internal organs, especially the descending colon and very rarely the lymphatic glands, may become affected. The mucous membranes are involved in the latest stages, when fever, hæmorrhage, and marasmus precede the fatal termination.

The TREATMENT is the same as for carcinoma. Injections of Coley's toxines or formalin water may be used 1 = 1000.

DERMATONEUROSES

SENSORY DERMATONEUROSES

Dermatalgia.—Idiopathic pain of the skin.

Hyperæsthesia.—Exaggeration of the cutaneous sensibility.

Tactile Anæsthesia.—Insensibility of the skin to touch.

Thermoanæsthesia.—Insensibility of the skin to heat.

Analgesia.—Insensibility of the skin to pain.

Dysæsthesia.—Hyperæsthesia with some disagreeable sensation.

Allochiria.—Confusion as to which side is the subject of a sensory impression.

Error of Place.—Impossibility to locate the exact spot of excitation.

Delayed Sensation.—Unconsciousness of sensation for several seconds. The sensory dermatoneuroses just enumerated are usually associated with either functional or organic nervous derangements, and must be treated in accordance with their ætiological factors.

Pruritus.—This is severe itching without, primarily at least, any appreciable lesion of the skin. It is worse at night, and as a result of scratching there are excoriations, papules, etc. It may be local or general, and is often dependent upon constitutional disturbances, such as diabetes. The regions commonly affected are the anus (*pruritus ani*, often caused by hæmorrhoids, anal fissures, or fistulæ), the vulva (*pruritus vulvæ* may be due to vaginal or uterine discharges), and the *scrotum*. Pruritus is often met with in old people (*pruritus senilis*), and in some cases it makes its appearance only during the cold season of the year (*pruritus hiemalis*). The latter variety affects mostly the extensor surfaces of the lower limbs.

THE TREATMENT OF PRURITUS.—(1) Local anæsthetics: Refrigeration, cocaine, orthoform, menthol, chloral, camphor, phenol, resorcin, sulphophenate, guaiacol, salicylate of methyl. (2) Medicines causing a substitutive reaction: the local anæsthetics given above; alcohol, vinegar, chloroform, tincture of iodine, essence of turpentine, hot and dry air. (3) Antiphlogistics: local vasoconstrictors, cocaine, adrenalin, hot water. (4) Agents affecting the integuments: nitrate of silver, picric acid, tannin. (5) Topical anodynes preserving the skin from irritation: lime and oil liniments, glycerinated lime water, oil, vaselin, lanoline, traumaticin, collodion. Attention must be paid to the underlying cause, such as dyspepsia, anæmia, neurasthenia, etc., with local cauterization of fissures and ulcers and brushing the itching parts with a hair brush. The surgical treatment of pruritus vulvæ is by resection of the genitocrural, ilioinguinal, inferior pudendal, and superficial perineal nerves.

MOTOR DERMATONEUROSES

Cutis Anserina (**Goose Skin**).—There is erection of the hair follicles under the form of small miliary projections, due to nervous excitation of the muscular fibres of the skin.

TROPHIC DERMATONEUROSES

Acrodynic Erythema (**Erythromelalgia**).—Erythematous brownish spots form, mostly on the palms of the hands and the soles of the feet, sometimes accompanied by œdema, ecchymosis, cyanosis, or even partial gangrene. It is due to a toxic cause acting upon the nervous system, especially the spinal cord. There are often numbness, pricking, tingling, and lancinating pain.

The TREATMENT is tonic and hygienic, directed to the underlying cause.

CHRONIC TROPHONEUROTIC ERYTHEMA

Glossy Skin (**Atrophoderma**).—The skin is smooth and shining in a diffuse or mottled manner, pink or red in color, and often appears as if varnished. The disease affects mostly the extremities, especially the hands and feet. There are neuralgic pains, with gradual thinning of the skin and later also of the muscles. It usually follows an injury to nerves. The duration is from weeks to years.

The TREATMENT is directed to any underlying cause.

VASCULAR DERMATONEUROSES

Anæmia (pallor) and **hyperæmia** (blushing) are examples of this neurosis; to this class belongs also:

Raynaud's disease, or sphaceloderma, which is observed in three well defined degrees. Pain is the most prominent symptom.

1. *Local syncope* occurs mostly in the extremities, and produces a condition known as "dead fingers or toes."

2. *Local asphyxia* affects usually the fingers, toes, and ears, and generally follows local syncope, but may also appear independently. If severe, it is accompanied by stiffness, swelling, and lividity of the affected parts.

3. *Local, or Symmetrical, Gangrene.*—Small areas of necrosis appear on the pads of the fingers and toes, also at the edges of the ears and tip of the nose.

The PROGNOSIS depends on the underlying cause.

The TREATMENT is directed to the underlying cause.

MAL PERFORANS (PERFORATING ULCER OF THE FOOT)

This is observed in severe constitutional disease.

The treatment is local (antiseptic dressing) and constitutional.

DISEASES OF THE APPENDAGES

THE HAIR

Atrophy of the Hair; Alopecia (Baldness)

Alopecia, Primary or Parasitic.—This variety includes the affection known as *alopecia areata*, which involves usually the scalp and more rarely the beard, eyebrows, eyelashes, etc. It begins with one or two rounded circumscribed patches; the skin is smooth, soft, and of a dead white color; it may develop suddenly or gradually and spreads peripherally, at times affecting the whole scalp. To this class belongs also the baldness due to tinea trichophytina, tinea favosa, and the different forms of folliculitis.

TREATMENT.—Formulæ Nos. 30 and 46.

Alopecia, Secondary or Non-Parasitic.—Under this head are classed the cases due to nutritional changes. It is usually associated with senility, syphilis, and myxœdema, or follows acute infectious diseases, typhoid fever, trauma, or severe neuralgia. It may also be congenital (hypotrichosis congenita).

The PROGNOSIS is good in the primary, bad in the secondary, forms, except those following acute infectious diseases.

TREATMENT.—Removal of the cause and the use of tonics internally. Formula No. 27.

Hypertrophy of the Hair

Hypertrichosis (Hirsuties).—This is an abnormal growth of hair, involving either a greater part of the body or only the face, neck, arms, bust, etc.

TREATMENT.—Calcium sulphide applied locally and electrolysis (see Nævus), 10 to 30 milliampères.

Canities (grayness of the hair) is due to absence or diminution of pigment, the presence of bullæ between the hair fibrillæ, or both causes.

CANITIES, CONGENITAL, may be partial or general. One or more tufts of silvery or yellowish white hair may appear in the scalp.

CANITIES, ACQUIRED, may be caused by neuralgia, erysipelas, perhaps also fear and emotion and unknown causes.

TREATMENT.—Order the hair wash, formula No. 47. **The hair** may be dyed if it must be.

THE NAILS

Onychia is inflammation of the matrix of the nail. There are pain, redness, and ulceration of the matrix; the nail soon rots and crumbles away at the root. It is usually due to injury of the overlying skin with secondary infection.

TREATMENT.—A moist antiseptic dressing or removal of the nail may be employed.

Onychatrophia.—This is characterized by shedding, crumbling, and deformity of the nails, and is associated with different diseases, such as *eczema* (the skin about the nail becomes reddened, thickened, and the seat of considerable itching; there is a lack of natural polish and lustre); *psoriasis* (dirty yellowish discoloration and loss of polish of the nails, which may be broken, pitted, and furrowed); or *tinea trichophytina* ("onychomycosis"), in which the nail is at first yellowish, dirty, and friable at its free extremity, and later streaked with yellow, loosened from its seat, and hypertrophied.

TREATMENT.—Pay attention to the underlying cause.

Onychogryphosis.—There are thickening and deformity of the nail plate itself or deformity and distortion caused by a heaping up of the epithelium of the nail bed under the nail plate.

TREATMENT.—Manicure.

Ingrowing nail occurs mostly on the great toe, occasionally also on the fingers. It is usually a result of wearing tight boots.

TREATMENT.—Bathe the parts in hot soap suds until the nail and surrounding skin are softened. Separate the nail from the injured skin and instill pure carbolic acid between them, followed by neutralization with alcohol. After repeating this process for a few days, raise and trim the ingrown nail and keep the parts free from dirt and pressure. If it is very obstinate, surgical interference may be required.

FORMULARY

1. ℞ Acidi salicyl., ... gr. xv–xx;
Acidi carbol., ... gtt. xij;
Ung. hydrarg. ammon., ... ʒij;
Ung. zinci oxidi, ...ad, ℥j.
M.: For parasitic skin lesions.

2. ℞ Olei cadini (oil of cade), ... ʒj;
Ung. zinci oxidi, ...ad, ℥j.
M.: For chronic forms of eczema.

3. ℞ Plumbi acetici., ... ℥ss.;
Pulv. camphoræ, ... gr. xv;
Olei amygdal., ... ℥ij;
Cerati flav., ... ℥j.
M.: F. ungt. For wet eczema.

4. ℞ Sulphuris præcipit., ... ʒj–ʒij;
Resorcini, ... gr. x;
Acetanilidi, ... ʒss.;
Ung. petrol., ... ℥j.
M.: In parasitic varieties.

5. ℞ Acidi carbol., ... gtt. xv;
Pulv. camphoræ, ... gr. x;
Alcoholis, ... ʒij;
Glycerini, ... ʒij;
Olei amygdal., ...ad, ℥j.
M.: To relieve itching.

6. ℞ Acidi salicyl., ... ʒss.;
Resorcini, ... gr. xx;
Alcoholis, ... ℥jss.;
Olei ricini, ... ad, ℥ij.
M.: In eczema or parasitic affections of the head (tinea favosa).
(H. B. Sheffield).

7. ℞ Amyli, ... ʒij;
Acidi borici, ... ʒss.;
Cocainæ, ... gr. jv;
Ung. zinci oxidi, ... ad, ℥j.
M.: In acute cases with severe itching.

8. ℞ Sulphuris præcip., ... ʒj–ʒij;
Pulv. camphoræ, ... gr. x;
Pulv. tragacanthæ, ... ʒss.;
Alcoholis, ... ʒij;
Aquæ calcis, ... ℥j;
Aquæ rosæ, ... ad, ℥ij.
M.

9. ℞ Hydrarg. chlor. corrosiv., ... gr. iij;
Acidi hydrochlor. dil., ... ʒj;
Alcoholis, ... ℥j;
Glycerini, ... ℥ss.;
Aquæ, ... ad, ℥jv.
M.: Apply at bed time, and remove with sugar water in the morning.

10. ℞ Hydrarg. chlor. corros., ... gr.vj;
Acidi acetic. dil., ... ʒij;
Boracis, ... gr. xl;
Aquæ rosæ, ... ad, ℥jv.
M.: Apply twice daily.

11. ℞ Acidi salicyl., ... gr. x;
Zinci oleatis, ... ℥j.
M.: S. dusting powder.

12. ℞ Acidi salicyl., ... gr. xv;
Cretæ præp., ... ʒss.;
Aluminis exsic., ... ad, ℥j.
M.: Mix and powder finely.

13. ℞ Acidi borici, ... ʒss.;
Pulv. camphoræ, ... gr. x;
Bismuth subgal., ... gr. x;
Talci, ... ʒjv;
Zinci oxidi, ... ad, ℥j.
M.: S. dusting powder.

14. ℞ Stearate of zinc with acetanilide.
Sig. dusting powder.

15. ℞ Sulphuris præcip., ... ʒij;
Beta naphthol, ... ʒss.;
Ung. petrolati, ... ℥j.
M.: To relieve itching in chronic affections, tar may be added.

16. ℞ Chrysarobin., ... gr. xv;
Ung. petrolati, ... ℥j.
M.

17. ℞ Hydrarg. chlor. mitis, ... gr. xv;
Pulv. tragacanth., ... ℥j.
M.: Dusting powder in herpes.

18. ℞ Hydrarg. chlor. mitis, ... gr. x;
Acid. salicylic., ... gr. xv;
Pulv. tragacanth, ... ʒij;
Pulv. amyli, ... ad, ℥j.
M.: Sig. dusting powder.

19. ℞ Balsami peruv., ... ʒij;
Sulph. præcip., ... ʒij;
Acidi salicyl., ... ʒss.;
Ung. petrolati, ... ℥ij.
M.: In scabies it is preceded by scrubbing with sapo viridis.

20. ℞ Ung. hydrarg. nitr., }
Ung. sulphuris, } āā, ... ʒjv.
M.

21. ℞ Ichthyolis, ... ʒj;
Ung. zinci oxidi, ... ℥j.
M.

22. ℞ Ung. hydrarg., ... ʒvj;
Ung. belladonnæ, ... ad, ℥j.
M.: In itch or in syphilitic bubo.

23. ℞ Bismuth subcarb., ... ℥ij;
Ung. zinci, ... ℥j.
M.: S. for facial eczema.

24. ℞ Sulph. præcipit., ... ʒij;
Ung. zinci oxidi, ... ʒjv;
Terræ silicicæ, ... ad, ℥j.
M.

25. ℞ Resorcini, ... ʒj;
Glycerini, ... ʒss.;
Aq. aurant. flav., ... ʒjv;
Alcoholis, ... ad, ℥j.
M.

26. ℞ Ichthyol, ... ʒj;
Aquæ, ... ℥j.
M.: For intertrigo.

27. ℞ Sulphuris præcip., ... ʒij;
Pulv. camphoræ, ... gr. x;
Tr. cantharidis, ... ʒij;
Resorcini, ... gr. xx;
Olei myrciæ, ... gtt. x;
Alcoholis, ... ad, ℥ij.
M.

(H. B. Sheffield.)

28. ℞ Acetanilidi, ... ʒss.;
Olei amygdalæ am., ... ʒij;
Ung. aquæ rosæ, ... ad, ℥j.
M.

29. ℞ Acidi carbol., Olei petrolei, } āā, ... ʒij;
Tinct. iodini, Olei ricini, } āā, ... ʒiijss.;
Olei rusci (German), ... ad, Oj.

M.: After clipping the hair close to the scalp this mixture is applied over the entire scalp—more thickly over the affected spots—by means of a painter's brush, once a day for five successive days. On the sixth day it is wiped off with a rag dipped in plain olive oil; now the hair is clipped again and the scalp washed thoroughly but gently with green soap and a *soft* nail brush, care being taken that all the scales and loose hair covering the scalp are removed. No epilation is, as a rule, necessary. On the seventh day the mixture is reapplied as thickly as before and the whole process is repeated regularly for three or four successive weeks—the length of time depending upon the severity of the case—when it is found that new hair begins to appear and no trichophyton fungi can be discovered in the hair extracted for microscopical examination.

These procedures are followed by a few days' application of a 10 per cent sulphur ointment. (H. B. Sheffield.)

30. ℞ Chrysarobin ointment, 20 to 30 grains to the ounce.

LOCAL APPLICATION FOR CORNS

31. ℞ Salicylic acid,	15 grains;
Extract of cannabis indica,	7½ grains;
Alcohol, 90 per cent,	16 minims;
Ether, 62 per cent,	37 minims;
Flexible collodion,	80 minims.

M.: To be applied every evening for eight days. On the eighth day a prolonged foot bath should be taken, then with a scraper the mass of collodion, with the greater part if not all of the corn, may be removed. This treatment may be repeated if necessary.

32. ℞ Pulv. camphoræ,	ʒss.;
Aquæ ammon.,	ʒj;
Ext. hamamelis,	ad, ℥iij.

M.

33. ℞ Phenic acid,	gr. xv;
Salicylic acid,	ʒss.;
Tartaric acid,	gr. xlv;
Glycerole of starch,	℥ij.

M. (Brocq.)

34. ℞ Pyrogallic acid,	ʒiss.;
Salicylic acid,	gr. xxx;
Pure vaseline,	℥ij.

M. (Brocq.)

35. ℞ Liq. plumbi subacet. dil. (1–20), Aquæ rosæ,	āā, ℥viij.

M.

36. ℞ Ung. zinci oxidi, Ung. aq. rosæ,	āā, ℥j.

M.

37. ℞ Balsami peruviani,	ʒj;
Resorcini,	gr. x;
Ung. aquæ rosæ,	℥j.

M.

38. ℞ Acidi salicyl.,	gr. xv;
Sulphuris præcip.,	ʒj;
Pulv. camphor.,	gr. x;
Alcoholis,	℥jss.;
Olei ricini,	℥j.

M.

39. ℞ Cerati resinæ comp.,	ʒvij;
Olei olivar.,	ad, ℥j.

M.

BOUGARD'S CAUSTIC COMPOUND FOR CANCER

40. ℞	Wheat flour,	℥ij;
	Starch,	℥ij;
	Arsenic,	gr. xv;
	Cinnabar,	ʒj;
	Sal ammoniac,	ʒj;
	Corrosive sublimate,	gr. j;
	Saturated solution of chloride of zinc,	ʒviij.

M.

41. ℞	Arsenous acid,	1 part;
	Cocaine hydrochloride,	5 parts;
	Boiled distilled water,	500 parts.

M.: One to 2 c.c. (16 to 32 min.) of this liquid are injected into the neoplasm at intervals of from two days to a week.

SUN BURN LOTION

42. ℞	Acidi citrici,	ʒij;
	Ferri sulphatis puri,	gr. xviii;
	Camphoræ,	q. s.;
	Aq. flor. sambuc.,	℥iij.

M.: The camphor is placed in the bottle in a lump, undissolved.

HYDROQUINONE WASH FOR THE SKIN

43. ℞	Hydroquinone,	gr. xlviii;
	Acid. phosphoric, glac.,	gr. xxx;
	Glycerini,	ʒij;
	Aquæ dest.,	℥vj.

M.

"ALBADERMINE"

Under this empirical title, a foreign surgeon has devised the following process of removing "tan" and the milder variety of "freckles":

SOLUTION "A"

44. ℞	Potass. iodid.,	ʒij;
	Iodi.,	gr. vj;
	Glycerini,	ʒiij;
	Infus. rosæ,	℥jv.

Dissolve the iodide of potassium in a small quantity of the infusion and a drachm of the glycerine; with this fluid moisten the iodine in a glass mortar and rub it down, gradually adding more liquid until complete solution has been obtained; then stir in the remainder of the ingredients, and bottle the mixture.

SOLUTION "B"

℞ Sodii hyposulph.,	℥ss.;
Aquæ rosæ,	Oj.

Dissolve and filter.

With a small camel's hair pencil or piece of fine sponge apply a little of "Albadermine A" to the tanned or freckled surface until a slight but tolerably uniform brownish yellow skin has been produced. At the expiration of fifteen or twenty minutes moisten a piece of cambric, lint, or soft rag with "B" and lay it upon the affected part, removing, squeezing away the liquid, soaking it afresh, and again applying until the iodine stain has disappeared. Repeat the entire process thrice daily, but diminish the frequency of the application if tenderness is produced. In the course of from three or four days to as many weeks either the freckles will have disappeared entirely, or their intensity will be very greatly diminished. "Summer freckles" yield very speedily to this treatment.

ANTI-FRECKLE LOTION

45. ℞ Hydrarg. bichlor.,	gr. xii;
Acid. hydrochlor., dilut.,	ʒiij;
Fruct. amygd. amar.,	℥jss.;
Glycerini,	℥j;
Tinct. benzoin.,	ʒij;
Aquæ florum aurant.,	q. s.

Dissolve the corrosive sublimate in three ounces of the orange flower water, add the hydrochloric acid, and set aside. Blanch the bitter almonds, and bruise them in a mortar, adding thereto the glycerine and using the pestle vigorously; a smooth paste is thus obtained. Then add gradually about 9 ounces of the orange flower water, stirring constantly, continuing this operation until a fine, creamy emulsion is the result. Subject this to violent agitation—preferably with the aid of a mechanical egg whisk—and allow the tincture of benzoin to fall into it the while drop by drop. Then add the mercurial solution, filter, and make up the whole to the measure of one imperial pint with more orange flower water.

BISMUTH OINTMENT FOR FRECKLES

℞ Bismuthi subnitr.,	ʒij;
Ung. simpl.,	℥ij.

M.: Apply to the skin at night and remove in the morning with a little cold cream previous to washing.

46. Shampoo with tar soap ten minutes, and wash and dry the scalp. Apply:

℞ Hydrarg. bichlor.,	gr. vij;
Glycerini,	ʒj;
Aquæ,	℥v.

M.: After this add a half per cent solution of naphthol in absolute alcohol. Then apply:

℞ Acid. salicyl., ... gr. xxx;
Tinct. benzoin, ... ʒj;
Ol. olivar., ... ℥iij.
M.: Against parasitic alopecia.

47. ℞ Potass. carbon., }
Ammon. carbon., } āā, ... ʒss.;
Glycerini, ... ʒjv;
Aquæ, }
Spir. vini., } āā, ... ℥viij;
Ol. lavandal, ... gtt. vj.
M.: Hair wash.

FOR PSORIASIS

48. ℞ Acid. salic., ... ʒij;
Chrysarobin., }
Olei rusc., } āā, ... ℥j.
Sapon. virid., }
Vaselin., } āā, ... ʒv;
M.: Apply twice daily for one week and repeat if necessary.

CHAPTER XXIX

OTIC MEMORANDA

Synopsis: General Remarks.—Minor Local Ailments in or about the Ear.—Otitis Media, Acute and Chronic.—Mastoid Disease.—The Sense of Hearing.—Deafness and Aural Vertigo.—Diagnostic Value of Fluid Discharges from the Ear in Head Injuries.—Formulary.

GENERAL REMARKS

An examination of the external auditory canal is readily made by means of an ear speculum and reflected light, as shown in the illustration. Secretions, wax, and other débris frequently hide the drum membrane and should be removed by syringing or by means of a cotton carrier.

Other necessary requisites for aural examinations are the Eustachian catheter, the Politzer inflation bag, and an auscultation tube.

The color of the drum membrane under normal conditions is pearly white. When an inflammation of the middle ear exists, the membrane is either pink or deeply reddened, and may be bulging.

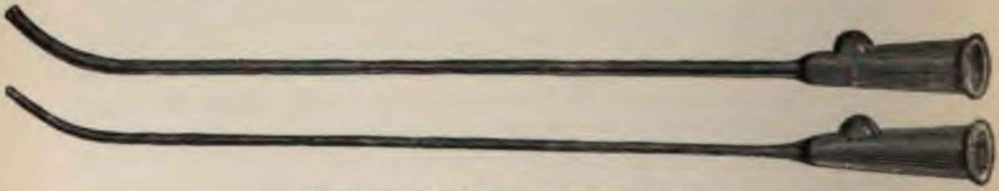


Fig. 221.—Eustachian Catheters (Roosa).

Perforation of the drumhead is visible or is detected by inflating the ear by means of Politzer's bag and listening for the hissing sound as the air is forced through the opening in the membrane.

Hearing may be tested by means of the voice, watch, or tuning fork.

Earache, deafness, tinnitus, and discharge are the principal symptoms of an inflammatory condition in or about the ear. Infection usually takes place from the nasopharynx and is generally secondary to the various forms of inflammation in this locality. Otitis media is therefore a frequent sequel to diphtheria, measles, scarlatina, amygdalitis, parotitis, influenza, typhoid fever, adenoids, and many other pathological conditions. In order to prevent, if possible, ear complications in the course of the exanthemata, the author advises the instillation of salt water (ʒj to pt. j) into the nostrils, ½ teaspoonful at a time (see article on Nasopharyngeal Toilet).

It is important to practise anterior and posterior rhinoscopy in connection with ear work, and it is well to remember that we meet with reflex otalgia from dental irritation and with aural vertigo, faintness, and asthma.

MINOR LOCAL AILMENTS IN OR ABOUT THE EAR

External otitis from infection is generally traumatic and caused by overcleanliness in using hairpins, toothpicks, or the finger nail for the purpose of cleansing the auditory canal. It is apt to affect the structures of the canal and the upper posterior region of the auricle. The parts become swollen and extremely painful and local periostitis develops, the middle ear remaining intact. This type of external ear disease has often been mistaken and treated for mastoiditis.

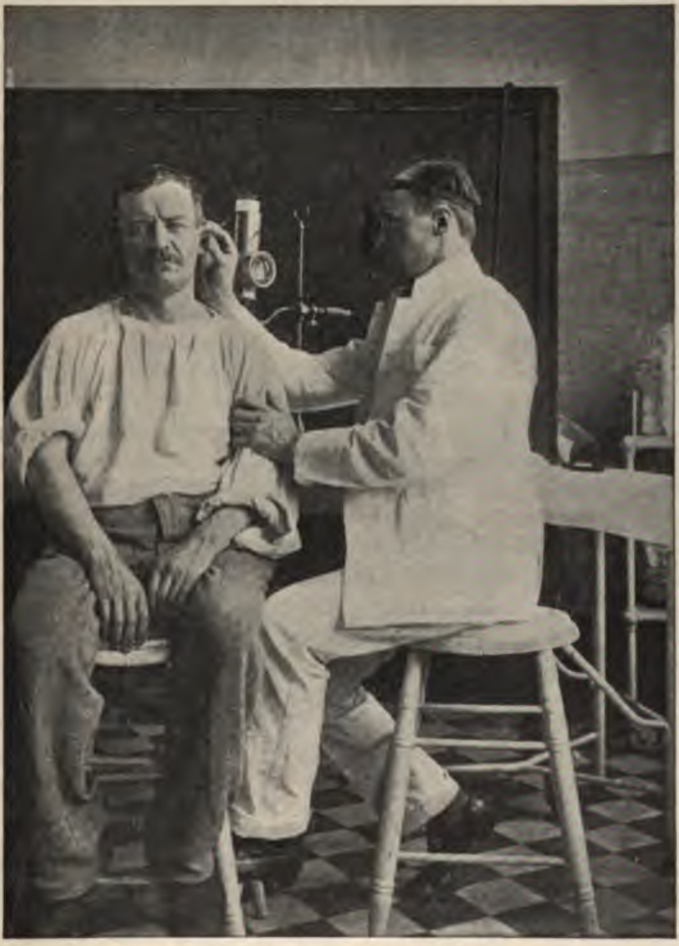


FIG. 222.—EXAMINATION OF THE EAR.
The lamp should be placed to the right of patient.

TREATMENT.—Strict cleanliness and the repeated application of a 3 per cent acetate of aluminum solution are very effective in this condition. Dry heat in the form of a hot water bag will relieve the intense pain. In the event of fluctuation (pus formation), a free incision is to be made.

Eczema of the auricle and external auditory canal presents symptoms identical with those observed in eczema of the skin of any other part of the body.

For the TREATMENT, see Eczema.

Furuncles can readily be distinguished from deeper ear affections by careful inspection, and are best treated by hot fomentations and incision according to general surgical principles in regard to strict antisepsis. Quite an extensive infection may take place.

Impacted cerumen gives rise to buzzing in the ear, deafness, and sometimes vertigo.

TREATMENT.—Syringing with warm water, preceded by filling the auditory canal with olive oil or *peroxide of hydrogen.*

Foreign bodies, such as insects, beads, and buttons, are sometimes found in the external auditory canal, and may give rise to the symptoms enumerated under "impacted cerumen." They are best removed by syringing with warm water. Foreign bodies, such as peas or beans, which are apt to swell in water, should be removed by the blunt hook or forceps. Anæsthesia may be necessary, especially in children.

TREATMENT.—A piece of soft rubber tube, of the length of a cigarette and of the proper size, is to be introduced into the ear. The end of the tube is dipped in paraffin and pushed into the canal until it comes in contact with the foreign body, whereupon the operator, applying his mouth to the free end, aspirates forcibly, at the same time throwing back his head.

Malformations, wounds, tumors, cysts, erysipelas, frostbites in and about the ear present the same features as similar pathological conditions in other parts of the body and require the same management.

Otitis media catarrhalis is caused by changes of temperature, so called colds, and bathing in cold water, but most frequently is due to diseases of the nasopharynx, adenoids, etc. It is manifested by pain, tinnitus, hardness of hearing, and dizziness. The tympanum is red and if considerable exudation is present there is bulging. This catarrh of the middle ear may terminate either in recovery without rupture or after rupture of the drum membrane and escape of the exudation, or in subacute or chronic catarrh.

TREATMENT.—In the acute stage apply hot applications and leeches behind the ear to relieve pain, or, if the latter continues, paracentesis should be resorted to, followed by daily cleansing of the auditory canal with mild antiseptic solutions. In chronic cases Politzer's inflation method in addition to cleanliness is to be practised.

Acute otitis media purulenta may occur as a result of severe inflammation of the nasopharynx or in the course of various infectious and contagious diseases. *Acute* purulent inflammation of the middle ear resembles simple catarrhal inflammation, except that the symptoms are more pronounced. Perforation of the membrane takes place in the majority of cases and is followed by immediate relief from the pain and sense of fulness. The secretion is very profuse at first, but gradually ceases with the healing of the perforation. This type of middle ear disease frequently leads to involvement of the mastoid, also to extradural abscess, perisinusitis, and meningitis.

The TREATMENT is the same as for catarrhal inflammation of the middle ear. The more severe cases require management in accordance with the complication present.

Chronic purulent inflammation of the middle ear is characterized by a discharge which may be purulent or mucopurulent and sometimes tinged with blood; and by deafness, moderate or marked. The drum membrane is perforated or completely destroyed. There may be a formation of *granulations* and *polypi*, which are very apt to cause retention of pus; or caries and destruction of the ossicles. Caries of the attic and cholesteatoma constitute serious complications. Other serious complications and sequelæ are: Mastoiditis (usually brought on by an exacerbation of chronic purulent inflammation of the middle ear), brain abscess, sinus thrombosis, caries of the carotid canal with rupture of the internal carotid artery, meningitis, pyæmia, facial paralysis, and extensive necrosis of the temporal and adjacent bones.

TREATMENT.—Enforce scrupulous cleanliness, with attention to the nasopharynx (adenoids). In tuberculosis and syphilis, use constitutional treatment. Polypi should be removed by means of the snare or forceps. Granulations may also be destroyed by instilling pure alcohol, 5 to 10 drops, twice daily. If the discharge is profuse, irrigations with boric acid solution must be done once or twice a day before applying local treatment, i. e., with alcohol, etc. Carious ossicles must be removed. In case of caries of the attic and cholesteatoma, a radical operation is necessary to save life.

MASTOID DISEASE

Inflammation of the mastoid process of the temporal bone forms a frequent complication of suppuration of the middle ear. It is manifested by pain in the mastoid region and tenderness on deep pressure, fever, if the inflammation is acute, and swelling, redness, and heat as the disease advances. If the inflammation invades the middle fossa of the skull, an abscess may be produced beneath the dura mater or abscess of the brain and meningitis may result or sinus thrombosis.

Treatment.—Attention should be paid to the tympanic cavity by permitting the free exit of the pus and by keeping the auditory canal thoroughly clean. The inflammation should be reduced by ice applications or by means of Leiter's coils. If these means fail surgical interference is necessary.

SENSE OF HEARING

The *sense of hearing* is often affected in various ways. *Nervous deafness* is caused by lesions of the eighth, or auditory, nerve, of the cortical centres of hearing, or of the acoustic nuclei. *Labyrinthine disease* may cause deafness, also drugs, such as quinine and the salicylates, inflammations, including syphilitic exudates, injuries, hæmorrhages, and tumors, primary atrophy as occurring in locomotor ataxia, and mechanical causes, such as the constant noises and jarring to which locomotive engineers and boiler makers are subject.

Tinnitus aurium is a term applied to those subjective sounds which resemble hissing, buzzing, humming, beating, musical notes, etc. It may be caused by neurasthenic conditions, local ear disease, gastrointestinal toxæmia, reflex irritants, and arteriosclerosis.

Vertigo may be of aural origin not connected with Ménière's disease.

Hyperacusis (auditory hyperæsthesia) is an abnormal acuteness of hearing. It is observed in hysteria and hypnotic states. It may occur in facial paralysis.

Dysacusis, or **painful hearing,** occurs in neurasthenic and hysterical conditions, in feeble people, in brain congestion, as in fevers, in meningitis, and in local inflammation of the ear.

Impairment of hearing may be due to the presence of *adenoids, enlarged tonsils, polypi, catarrhal conditions of the Eustachian tube, hypertrophic and atrophic rhinitis, etc.* *Boiler makers* are apt to have deafness, and the hearing of the *aged* is not acute. Children with impaired hearing require special education, and the sense of hearing in deaf mutes may be developed by systematic hearing exercises.

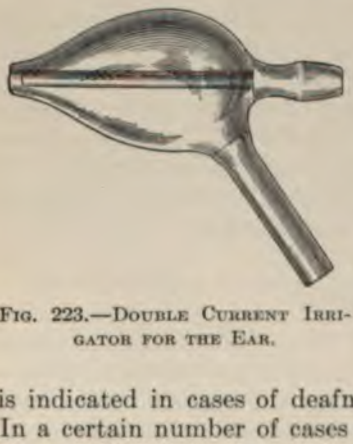


FIG. 223.—DOUBLE CURRENT IRRIGATOR FOR THE EAR.

TREATMENT. — The causes just enumerated should receive careful attention. Strict attention to the condition of the nasopharynx is indicated, viz., removal of adenoids and posterior hypertrophies of the inferior turbinals. Constitutional remedies, such as iron, arsenic, etc., are indicated in cases in which the general health is undermined. Iodide of potassium or sodium and mercury should be administered where syphilis is present. Inflation is indicated in cases of deafness due to chronic catarrh of the middle ear. In a certain number of cases where the perforation does not heal the use of an artificial drum membrane has been found serviceable, provided the discharge has ceased. In deafness due to internal ear disease strychnine and electricity may be tried.

Aural Vertigo.—*Ménière's disease* is a name given to all cases of vertigo due to an affection of the ear.

The CAUSE and PATHOLOGY are not known.

SYMPTOMS.—Sudden giddiness; the surrounding objects seem to revolve, or the patient may seem to be gyrating, usually from left to right. Walking or standing may be rendered impossible. The onset may be so abrupt as to cause the patient to fall. He may lose consciousness for a few minutes. Soon the dizziness passes away, but the patient is left prostrated. He is pale and bathed in cold perspiration. He may have nausea and vomit. Usually there is partial loss of hearing in one ear.

PROGNOSIS.—The paroxysms recur at irregular intervals. Sometimes they cease, but sometimes they become more frequent and deafness becomes complete.

Treatment.—In robust patients, pilocarpine, subcutaneously, ♏ v to x of a 2 per cent solution every other day, may help. If there is high arterial tension, nitroglycerine may be used. Sodium bromide and sodium salicylate have been recommended.

DIAGNOSTIC VALUE OF FLUID DISCHARGES FROM THE EAR IN HEAD INJURIES

While in the majority of cases in which bleeding and welling of cerebrospinal fluid from the ear are present a fracture of the *middle fossa* of the skull exists, these signs are not pathognomonic.

The great bulk of the hæmorrhage comes from the vessels of the arachnoid membrane and of the temporosphenoidal lobe of the brain, and not from the fractured bone.

The path of the discharges is along the sheath of the auditory nerve, through the lamina cribrosa to the vestibule, thence through the middle ear and ruptured membrane to the external meatus.

Excluding the extra risk of sepsis, the prognosis is, on the whole, better when these signs exist than when they do not.—Miles, *Edinb. Med. J.*, November, 1905.

FORMULARY

℞ Cocain.,	gr. x to xx;
Ol. anilin.,	ʒj;
Alcoholis,	ʒj.

M.: F. solut. Sig.: Anæsthetic for paracentesis. Saturate cotton and apply to the drum membrane. Children may have a few drops instilled into the ear.

℞ Acid boric.,	gr. x;
Aquæ, Alcohol., āā,	ʒjv.

M.: F. solut. Sig.: Ear drops for chronic purulent otitis, especially when associated with granulations.

To loosen wax previous to syringing, employ *peroxide of hydrogen.*

For parasitic external ear canal disease employ *absolute alcohol.*

Leeches for acute inflammatory conditions. Apply *in front or behind* the ear.

For *acute earache*, use water at 100° F. by means of a *glass ear tube with a recurrent flow.* It is safe and effective and will allay pain and often prevent mastoiditis. In infants, *breathe into the ear.* For acute external earache, use a *hot water bag.*

CHAPTER XXX

OPHTHALMIC MEMORANDA

SYNOPSIS: **General Remarks on the Sense of Sight, on Pupillary Phenomena, and on the Ophthalmoscope.—Injuries of the Eye and Foreign Bodies.—Diseases of the Eyelids.—Disease of the Lacrymal Apparatus.—Conjunctivitis and Trachoma.—Keratitis.—Disease of the Sclera, Ciliary Body, and Chorioid.—Iritis.—Glaucoma.—Disease of the Retina.—Disease of the Optic Nerve.—Cataract and Opacities.—Squint.—Eyesight.—Formulary.**

GENERAL REMARKS

Sense of Sight; Pupillary Phenomena; The Ophthalmoscope

SENSE OF SIGHT

Asthenopia is a condition characterized by fatigue and pain in or about the eyes, coming on shortly after near work (reading, writing, or sewing), and by inability to continue such work for any length of time. We distinguish *muscular*, *accommodative*, and *nervous* asthenopia.

Amblyopia is a partial loss of vision.

Amaurosis is total blindness, either with or without any perceptible intraocular lesion, and may be caused by injuries, hæmorrhages, poisons, such as alcohol, tobacco, quinine, salicylic acid, diabetes, uræmia, and hysteria. *Night blindness* and *snow blindness* are functional disorders.

Retinal, or **ocular, hyperæsthesia** is an abnormal sensitiveness to light. Exposure to an extreme light or a long subjection to darkness or hysteria may be the cause.

Photophobia (inability to endure light) is due to an irritation or inflammation of the cornea.

Hemianopsia, half blindness, is caused by lesions of the visual centres and optic tract (tumor, inflammations, softening, or hæmorrhage).

Scotomata are blind spots or areas in the visual field.

Diplopia, or **double vision,** occurs in convergent concomitant strabismus, in insufficiency of the internal recti muscles, and in paralysis of the orbital muscles.

Conjugate deviation, where both eyes turn decidedly to one or the other side, may be paralytic or spasmodic. The mechanism is not perfectly understood. Destructive lesions of the brain or of the pons may be responsible.

Mydriasis (iridoplegia) is due to paralysis of the sphincter of the iris. This causes dilatation and immobility of the pupil and is usually due to paralysis of the third nerve.

Cycloplegia, or **paralysis of the ciliary muscle,** usually due to the same cause as iridoplegia and commonly associated with it, causes loss of the power of accommodation. Local diseases of the eye, mydriatic drugs, diphtheria, and multiple sclerosis may be direct causes.

Ptosis, or **drooping lid,** is due to paralysis of the levator palpebræ superioris (third nerve), or the presence of some new growth in the lid, which may prevent the movement of the lid. There may be a functional ptosis in anæmic and nervous people, called "morning, or waking, ptosis." If the sympathetic fibres of the eye are paralyzed, we observe contraction of the pupil (*meiosis*). It does not respond to light, but does to accommodation (the Argyll Robertson pupil). If the sympathetic fibres are irritated, we observe dilatation of the pupil.

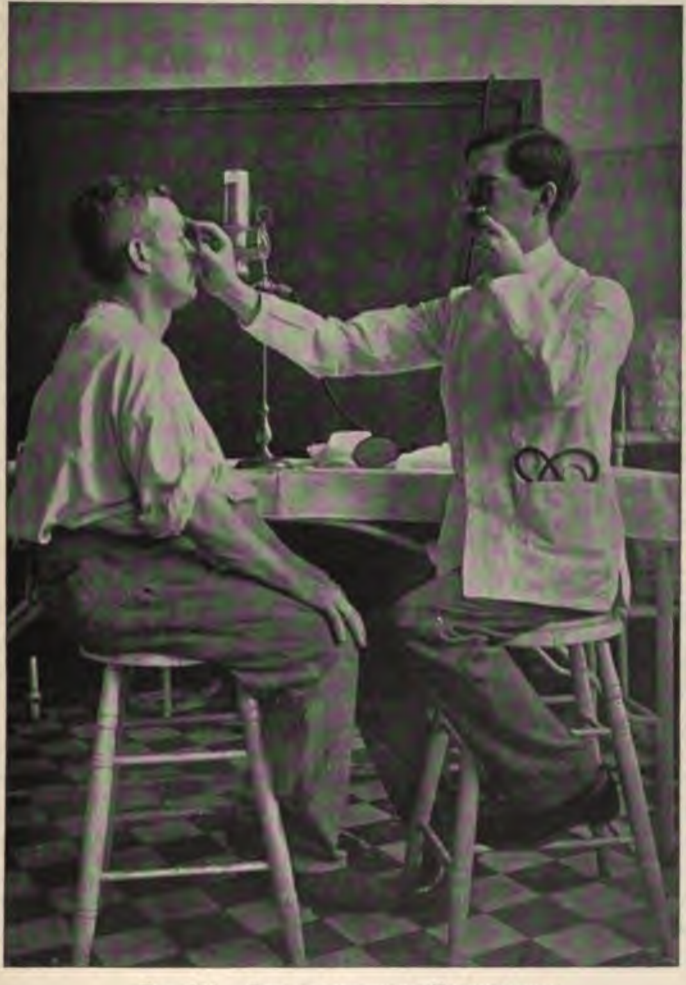


FIG. 224.—OPHTHALMOSCOPIC EXAMINATION.
The lamp should be placed to the right of the patient.

Strabismus, or **squint,** is a condition in which the visual axes do not meet, due to an incoordinate action of the external ocular muscles. *Convergent strabismus* is where both eyes are turned toward the nose. In *divergent strabismus* they are turned outward; in *alternating strabismus* the two eyes fix alternately. In *concomitant strabismus* the squinting eye has its full range of movement. In *constant strabismus* the condition is permanent.

Paralytic strabismus is due most frequently to syphilis and rheumatism. It is also due to basal meningitis, intracranial tumors, injuries, compression from orbital tumors, or the diphtheritic poison.

Spasmodic conjugate deviation of the eyes, from an irritation of the ocular nuclei or of the cranial areas or tracts of the brain, occurs in meningitis, hydrocephalus, semicircular canal lesions, and hysteria. Ocular diseases, refractive errors, muscle weakness, and paralyses may also cause it.

Nystagmus, or **rhythmical spasm,** is an oscillation of the eyeballs, in a lateral, vertical, or rotatory direction. It occurs in some degenerative nervous disorders, such as disseminated sclerosis, in hereditary ataxia, in tumors, especially of the cerebellum, in other focal lesions, and in meningitis. We see it as the result of hereditary visual weaknesses and refractive errors of various kinds, in albinoes and in chronic hydrocephalus. It is usually found in neurotic conditions, associated with ocular defects, in epilepsy, chorea, hysteria, neurasthenia, and insanity. It may be a reflex symptom due to some remote irritation. It may occur in miners, whence it has been termed "miners' nystagmus."

Spasm of the *levator palpebræ*, of a tonic nature, is sometimes seen.

Blepharospasm may occur without coexisting eye disease, but usually is caused by ocular trouble. It is a tonic spasm of the orbicularis palpebrarum. Occasionally it is an hysterical symptom.

Nictating, or **winking, spasm** is a clonic spasm of the orbicularis palpebrarum. It may be a symptom of hysteria or a part of the habit chorea.

Lagophthalmus may indicate facial paralysis or brain tumor.

Exophthalmus is found in Basedow's disease and other nervous derangements with exaggerated vascular tension.

Neurasthenic individuals may have amblyopia and defective color perception and the phenomenon called muscæ volitantes.

The **choked disc** has the following appearance: Œdema of the papilla, the retinal arteries as a rule diminished in size, the veins distended and tortuous, the outlines of the disc lost.

Ocular vertigo is a clinical phenomenon pointing to errors of refraction.

Romberg's sign is a swaying of the patient when standing with the eyes closed and the feet (soles and heels) together—locomotor ataxia.

THE PUPILS

The pupils react to light and to efforts of accommodation. Light normally contracts the pupil; there is a direct response to light, and there is a direct response in accommodation, i. e., when the eyes are fixed on an object. The pupil dilates from irritation of the cervical sympathetic, as when the skin of the back of the neck is pinched. The pupil reflex may be normal, tardy, or absent.

An **irregular outline** of the pupil is due to iritis and subsequent adhesions. *Inequality* of the pupils is observed in healthy individuals, as well as in persons afflicted with a central lesion (syphilis). *Mydriasis* (dilated pupils) is due to irritation of the dilating mechanism or to paralysis of the contractors of the pupil, as observed in mania, acute delirium, amaurosis, cerebral anæmia, valvular heart disease (dyspnœa), neurasthenia, coma, diphtheritic paralysis, meningitis, the use of belladonna, etc. Unequal transitory dilatation is not infrequent in tuberculosis. Unlimited dilatation may indicate irritation of the cervical sympathetic, from tumor or aneurysm or disease in the optic nerve. Mental derangements are often preceded by an alternating unilateral mydriasis. The pupil is also influenced by local disease of the eye.

Unilateral contracted pupil (**meiosis**) may be caused by locomotor ataxia, general paralysis, or the pressure of an aneurysm on the sympathetic. It may be due to a basilar tumor or to adhesions from a former iritis.

Bilateral meiosis is found, associated with inflammatory conditions, in photophobia, in all forms of spinal disease, in uræmia, in cerebral disease, and from the effects of opium, eserine, pilocarpine, or chloral.

In the **Argyll Robertson pupil** we note response to accommodation, but not to light, an early characteristic of tabes.

Immobility of the pupil is somewhat characteristic of brain syphilis.

Hippus.—Rhythmical contraction and dilatation of the pupil, called hippus, may point to sclerosis of the brain, epilepsy, acute meningitis, or pressure of a brain clot.

THE OPHTHALMOSCOPE

As it requires constant application and experience to master the details of an ophthalmoscopic examination, the general practitioner will content himself with a knowledge of the appearance of a healthy background and the choked disc, and with an examination of the transparent media for opacities and foreign bodies.

INJURIES OF THE EYE AND FOREIGN BODIES

Injuries of the eye are common, and the loose subconjunctival tissue favors subconjunctival hæmorrhage. It takes some time for the blood to be absorbed, and the application of hot water is perhaps the quickest method of assisting Nature to overcome the discoloration. Should a segment of the iris be detached we instill atropine.

Laceration at the pupillary margin is usually associated with hæmorrhage into the anterior chamber. This clot may remain for weeks. In such cases it is best to keep the pupil dilated with atropine.

Partial or total luxation of the lens and traumatic cataract may be caused by injury. Very little can be done in subluxation of the lens. Total luxation may necessitate extraction. Traumatic cataract may develop at once or very gradually. The prognosis must therefore be guarded.

Perforating injury at the sclerocorneal margin is a most serious lesion and very often necessitates removal of the eyeball.

Hæmorrhage into the vitreous may clear up in a few days under rest in bed and atropine, or there may be floating opacities in the vitreous with somewhat impaired vision.

Traumatic detachment of the retina must be treated by *rest.* Superficial *wounds of the conjunctiva* and *cornea,* if not infected, heal rapidly.

Infected wounds show a discharge and purulent infiltration. In such cases the use of the actual cautery may be indicated, followed by atropine. *Wounds* involving the *ciliary body* are serious and may end in panophthalmitis from infection, for which enucleation is the treatment.

Wounds complicated by the presence of **foreign bodies on the eyeball** are serious. If the foreign body is of metal which can be magnetized, removal by the electromagnet should be attempted.

Burns of the conjunctiva and cornea are not infrequent and may result in a slow healing ulcer and purulent discharge, with the danger of total destruction of the cornea.

In **lime burn** of the eye the lime particles should be removed and a solution of sugar applied, the patient put to bed, and the eye kept clean with boric acid solution. The pupil must be kept dilated with atropine. It is also important in such cases to instill a drop of any pure oil into the eye every two hours. Small foreign bodies on the *cornea* can be seen by means of a focal illumination and must be removed.

Foreign bodies in the conjunctiva can be seen by everting the lids, and must be removed. During such manipulations the eye can be made anæsthetic by means of a few drops of a 2 per cent cocaine solution.

Tumors, cysts, and parasites in and about the eye are of the same nature as in other localities, and require surgical treatment.

DISEASES OF THE EYELIDS

Blepharitis (blepharitis marginalis, ciliaris) is characterized by redness of the lids with the formation of crusts. It is either primary, due to infection by a microorganism, or secondary, due to conjunctivitis, errors of refraction, or eczema of the face.

TREATMENT.—Cleanliness, careful bathing with hot water and boric acid, and the application of yellow oxide of mercury ointment, 1 per cent, also constitutional treatment.

Hordeolum (Sty) and Chalazion.—Hordeolum is a small furuncle situated at the margin of the lid. A chalazion generally appears somewhat remote from the margin of the lid. It is a meibomian retention cyst, generally without heat, redness, or pain.

TREATMENT.—Hot applications and a thorough evacuation of the contents is the treatment for sty. If an incised and evacuated chalazion fills up again, its radical removal is indicated.

Warts, nævi, epithelioma, papilloma, syphilitic gumma, and eczema are occasionally observed on the lids, presenting the same symptoms as on other parts of the body. The same may be said of the treatment.

Blepharospasm, or involuntary closure of the lids, is either clonic in nature and due to errors of refraction or nervous disturbances, or tonic in nature, as a result of ulcerative conditions of the cornea, conjunctiva, etc.

The *treatment* is, therefore, based upon the removal of the cause.

Ptosis, or drooping of the upper lid, is either congenital or acquired; in the latter event it is due to traumatism, syphilis, or other diseases affecting the function of the third nerve.

TREATMENT.—Congenital ptosis is usually remedied by removal of an elliptical piece of skin with the underlying muscle from the upper lid and stitching together the edges of the wound. The other varieties of ptosis are treated in accordance with their respective causes.

Entropion (Trichiasis, Distichiasis).—A displacement of the cilia toward or against the cornea usually develops secondarily to granular lids. It is a painful affection and may give rise to ulcerations of the cornea. It is sometimes spastic in nature.

TREATMENT.—Frequent removal of the cilia is sometimes effective in relieving this condition, otherwise an operative procedure is required with the object of correcting the direction of the cilia.

Ectropion is an eversion of the margin of the lid with exposure of the conjunctiva. It is generally due to traumatism, especially burns, but sometimes to hypertrophy of the conjunctiva associated with trachoma.

TREATMENT.—Mild cases sometimes yield to local astringents; in severe cases operative interference is indicated.

Puffy eyelids are observed in *Bright's disease* and cardiac disease; trichiniasis, in local eczema and neuropathic œdema and in all inflammatory conditions in or about the eye.

DISEASE OF THE LACRYMAL APPARATUS

This usually manifests itself as an obstruction to the flow of tears through the lacrymal passages into the nose. This obstruction may be situated on the orbital or nasal part of the tear duct, and as a result the eye is constantly full of tears which run over the margin of the lid (epiphora). Inflammation of the lacrymal sac, dacryocistitis, may end in lacrymal fistula.

Treatment.—The aim of treatment is to remove the cause if possible and to endeavor to reestablish free drainage by means of bougies and needles. *Treatment of the inferior turbinated body of the nose* is frequently essential in this class of cases.

CONJUNCTIVITIS AND TRACHOMA

Conjunctivitis, or inflammation of the conjunctiva, is characterized by redness, swelling, supersecretion, and more or less pain and photophobia.

Simple conjunctivitis is caused by slight irritations and usually runs a brief and benign course. It differs from **epidemic catarrhal conjunctivitis** (pink eye) in not being contagious; furthermore, the secretion in simple conjunctivitis is mucous, while in the epidemic variety it is mucopurulent. Acute catarrhal conjunctivitis sometimes becomes chronic and leads to a follicular hypertrophy of the conjunctiva, the so called "*granular lids.*" The latter condition should not be confounded with the highly contagious form of conjunctivitis which is known as *trachoma*. In this affection the conjunctiva is studded with small, at first discrete, elevations which coalesce and form large, hard masses as the disease progresses. Owing to friction exerted by these granulations, the cornea frequently becomes ulcerated—

"pannus"—and if the irritation continues unabated, the cornea may be partially destroyed, giving rise to defective vision.

Much more rare than this variety of conjunctivitis is that caused by gonorrhœal infection and known as **purulent, or gonorrhœal, conjunctivitis** (purulent ophthalmia). It resembles ophthalmia neonatorum (q. v.) in its symptomatology and course.

The practitioner is occasionally confronted with cases of **diphtheritic conjunctivitis.** It is a very destructive disease. The infection is usually primary, although rarely it is secondary to diphtheria of the nasopharynx. Diphtheritic conjunctivitis is characterized by the formation of a false membrane and by the presence of diphtheritic bacilli in the discharge from the eyes, but not every pseudomembranous conjunctivitis is diphtheritic.

As a result of local or general conditions, the conjunctiva may be dry or moist. It is yellow in jaundice, pearly white in anæmic conditions, and frequently injected or inflamed from local and general causes. *Subconjunctival hæmorrhage* may result from a severe strain, as in coughing, etc., or injury.

General Treatment.—In all forms of conjunctivitis frequent cleansing of the eyes with boric acid solutions is of primary importance. Mild cases usually yield to this alone. Severer cases require daily applications of silver nitrate (1 per cent). Pronounced inflammatory symptoms should be treated with ice cloths. When cold applications are not well borne, warm applications are indicated. The surgical treatment of *trachoma* consists in *gentle* expression of the granules by means of the trachoma forceps designed for this purpose. This operation should be done under anæsthesia. The treatment of gonorrhœal conjunctivitis is described under Ophthalmia Neonatorum (q. v.). In diphtheritic conjunctivitis, diphtheria antitoxine should be employed in addition to cleanliness and applications of ice cloths and nitrate of silver (from 1 to 2 per cent). In the *management of contagious ophthalmia* in infants or adults the first concern ought to be the prevention of the propagation of the disease to sound eyes.

KERATITIS

The characteristics of keratitis are congestion, circumcorneal injection, pain, photophobia, excessive lacrymation, haziness, and impaired vision. It usually develops secondarily to diseases of the lids or to traumatism (from secondary infection). An exception to this rule is made by **interstitial, or parenchymatous, keratitis,** which is generally syphilitic in nature. In the beginning the inflammation of the cornea is *superficial,* but if it is not remedied early the cornea may undergo *ulceration* or *suppuration.* The latter conditions may lead to perforation of the cornea with involvement of the iris, resulting in permanent impairment of vision.

Phlyctænular keratitis usually begins with small vesicles on the palpebral conjunctiva (phlyctænular conjunctivitis). The vesicles gradually invade the ocular conjunctiva, break down, and form small ulcers. This form of keratitis is analogous to eczema of the skin and is generally observed in scrofulous children.

General Treatment.—The eyes should be cleansed with boric acid solution, bathed in hot water, and protected from bright light. Atropine (½ to

1 per cent) instillations should be employed to prevent iritic adhesions, also yellow ointment in the eye in case of central phlyctænula of cornea. In syphilitic keratitis this treatment should be supplemented by antisyphilitic treatment. As a general rule constitutional treatment is necessary. Corneal inflammation frequently terminates by leaving opacities of the cornea.

DISEASES OF THE SCLERA, CILIARY BODY, AND CHORIOID

Gout, rheumatism, syphilis, and traumatism are the chief causes of the diseases in question.

Episcleritis (scleritis) occurs in circumscribed, slightly nodular subconjunctival patches of a bluish pink color. It is not infrequently associated with chronic keratitis, iritis, or chorioiditis.

Cyclitis is an inflammation of the ciliary body, and may occur as a serous or as a suppurative inflammation. It is manifested by deep circumcorneal injection, with pain, and by tenderness on pressure. In *serous* cyclitis oblique examination discloses haziness of the anterior portion of the vitreous as well as the aqueous; in the *plastic* form a grayish mass behind the lens often obscures vision. *Suppurative* cyclitis is usually associated with suppurative chorioiditis and iritis.

Chorioiditis is characterized by a diffuse haziness of the vitreous, which contains minute floating opacities, hyperæmia, and serous or plastic exudation of the chorioid. After absorption of the exudation, atrophic patches are left behind which greatly impair vision. This is especially the case in the syphilitic and tuberculous varieties and in old myopic conditions.

TREATMENT.—Iodides and tonics internally. Hot applications locally.

IRITIS

Iritis.—Inflammation of the iris is characterized by contracted pupil, impaired mobility of the iris, and, in the presence of adhesions, irregular dilatation of the pupil if light is reflected into the eye or a mydriatic is instilled. There is also marked injection of the circumcorneal blood vessels, and a rosy zone encircles the cornea. Pain is severe in acute cases, and especially at night. Iritis may be caused by traumatism, syphilis, rheumatism, or tuberculosis.

Syphilitic iritis may appear in the serous, spongy, or gummatous form. The formation of gummata in the substance of the iris is pathognomonic of syphilis. It is accompanied by very severe pain. *Rheumatic* iritis is very prone to relapses and runs a very slow course. The pain is moderate.

TREATMENT.—Hot fomentations and atropine. Leeches if the congestion and pain are very pronounced. Constitutional remedies in the presence of syphilis, rheumatism, etc. Permanent adhesions (posterior synechiæ) may be treated by removal of a portion of the iris.

GLAUCOMA

Glaucoma sometimes comes on insidiously, with rapid increase in presbyopia, making frequent changes of glasses necessary for reading; iridescent vision, consisting of a halo around lights, the outer ring being red and the inner one bluish green; diminution in the field of vision, and *increased tension of the eyeball.* Gradually these symptoms become intensified, the cornea becomes steamy, like glass that has been breathed upon, the pupil dilated, and the increased tension of the globe becomes more pronounced, finally causing it to reach a stony hardness, and *the pupil becomes partly or fully dilated.*

The *acute form* is characterized by intolerable pain in the eyeball and by pronounced increase of tension. There is conjunctivitis, the cornea is anæsthetic and steamy, the aqueous is turbid, the iris is discolored, and the pupil is dilated. An attack may end in blindness. There are frequent recurrences and in cases of glaucoma not subjected to operation blindness is the final result.

Treatment.—Early recognition and treatment are of great importance. Mild cases sometimes yield to warm local applications and to the instillation of solutions of eserine, gr. j to ℥j (1: 500) or of pilocarpine in the strength of ½ per cent. Severe cases require an immediate operation (iridectomy).

DISEASES OF THE RETINA

Affections of the retina usually form a symptom of constitutional diseases, and according to their cause they are divided into albuminuric, hæmorrhagic, and syphilitic retinitis. In *albuminuric* retinitis whitish patches appear in the retina in the vicinity of the fovea centralis. In ***hæmorrhagic*** retinitis, which usually occurs in old people and almost always accompanies chronic interstitial nephritis, the arterial walls become much thickened and, as the disease progresses, permit of the escape of blood. *Syphilitic retinitis* is characterized by excessive exudations and more or less profuse hæmorrhages in the retina. In all forms of retinitis there is marked disturbance of vision and in severe cases even complete blindness.

Treatment.—Removal of the cause.

DETACHMENT OF THE RETINA

Detachment of the retina is due to an effusion of a serous liquid from the chorioid between it and the retina, and may be caused by a diseased vitreous, or chorioid, high myopia, a blow on the eye, etc. The subjective symptoms depend upon the degree and the amount of the detachment. The prognosis is highly unfavorable.

DISEASES OF THE OPTIC NERVE

Optic neuritis is generally caused by diseases of the brain or the meninges, syphilis, or lead poisoning. It manifests itself by haziness and swelling of the optic disc, gradual enlargement of the veins, and diminution in the size of the arteries. Hæmorrhages may appear both upon and around the disc. The extreme condition of optic neuritis is called "choked disc."

Optic atrophy is characterized by paleness of the disc, which becomes more white as the disease progresses. There is gradual loss of vision, which progresses by concentric limitation of the field. Optic atrophy is caused by the same ætiological factors which are operative in the production of optic neuritis and also by diseased processes of the retina, by embolism of the arteria centralis retinæ, or by tabes dorsalis.

Treatment.—Removal of the cause whenever possible. Attention to the general condition of the patient. Strychnine internally; this remedy is especially valuable in diseases of the optic nerve due to poisoning by alcohol, tobacco, etc.

CATARACT AND OPACITIES

Cataract is an opacity of the crystalline lens. Opacities occurring in the lens usually have a whitish appearance when examined by direct or oblique illumination. Certain forms of nuclear cataract give an amber tint, and in the exceptional cases of black cataract the color is deep brown. In lamellar cataract examination discloses a circular line of opacity which is most dense at its periphery. At first the patient usually experiences disturbance of vision in the form of dark lines or branching opacities, which are projected into space. The *causes* of cataract are old age, traumatism, exposure, privation, etc., i. e., interference with the nutrition of the lens. It not infrequently accompanies diabetes mellitus.

The treatment is surgical.

SQUINT, STRABISMUS

Strabismus (squint) is *concomitant* and *paralytic.* In order to ascertain the existence of strabismus, the patient is caused to fix the eyes on an object, and then they are alternately covered and uncovered. In order to distinguish concomitant from paralytic strabismus, the eyes are made to follow the movements of an object in various directions; in *concomitant* strabismus both eyes will move to the same extent and their movements will not be restricted in any direction; in *paralytic* strabismus the movement of the affected eye will be restricted in the direction of the action of the paralyzed muscle.

Treatment.—In concomitant strabismus errors of refraction should be corrected, and if the affection persists after the tenth year of age, tenotomy should be performed. In paralytic strabismus attention should be directed to the cause, such as syphilis and diphtheria. About 25 per cent of cases of strabismus may be overcome by non-operative treatment.

EYESIGHT AND EYE STRAIN

Emmetropia is the normal condition of the refracting media of the eye, in which the anteroposterior diameter is of the right length so that the rays of light from distant objects come to a focus upon the retina.

Eye Strain.—The symptoms of eye strain are multiple, and their origin in the eyes is often overlooked. The eyeballs ache. There is supraorbital pain or a pressure back of the eyes; letters on the page run together if one persists in using the eyes, and black spots dance about in the field of vision.

Hypermetropia (far-sightedness) is a condition in which the anteroposterior diameter is too short; the parallel rays come to a focus behind the retina.

Myopia (near-sightedness) is that form of error of refraction in which the anteroposterior diameter is elongated; parallel rays are thus brought to a focus in front of the retina. This condition may be congenital or acquired.

Astigmatism is a condition of the refraction of the eye in which rays of light passing through one of the principal meridians are refracted differently from those passing through the other meridians. It is produced by a difference in the curve of different parts of the cornea or, sometimes, of the crystalline lens.

Presbyopia is the natural change in the eyesight, viz.: the diminution of the power of accommodation, accompanying advancing years.

TREATMENT.—Correction of refraction. Hypermetropia is corrected by means of a convex (x) lens; myopia by the use of a concave (-) or dispersing lens; astigmatism by the use of cylindrical glasses so adjusted as to correct the difference between the refraction of the principal meridians in addition to correction of other errors of refraction if present.

EYE FORMULARY

Boric acid solution, ...	4 per cent;
Sulphate of zinc solution, ...	gr. 1 to ʒj;
Nitrate of silver solution, ...	1 per cent;
Atropine sulphate solution, ...	½ per cent for children; 1 per cent for adults;
Pilocarpine solution, ...	½ per cent;
Eserine solution, ...	gr. 1 to ʒj;
Cocaine solution, ...	2 per cent;
Bichloride of mercury solution, as an antiseptic in eye cases, ...	1 to 5,000;
Yellow oxide of mercury ointment, ...	½ to 1 per cent.

CHAPTER XXXI

ANÆSTHESIA, INTOXICATIONS, MISCELLANEOUS AILMENTS, KEEPING CASE RECORDS AND ACCOUNTS

SYNOPSIS: Remarks on General and Local Anæsthesia.—List of Poisons and Antidotes.—Gas Poisoning.—Ptomaine Poisoning.—Grain Poisoning.—Poisoning by Pigments and Preservatives.—Snake Bites.—Insect Bites.—Drug Habits and Alcoholism.—Seasickness and Mountain Sickness.—Hydrophobia.—Traumatic Tetanus.—Case Records and Accounts.

ANÆSTHESIA

REMARKS ON LOCAL AND GENERAL ANÆSTHESIA

General Anæsthesia

THIS is employed to relieve pain in surgical and obstetrical manipulations. It is employed in severe eclampsia, in setting fractured and dislocated bones, in making important x ray exposures, in the case of children who would not be apt to hold still, and for facilitating painful examinations for diagnostic purposes.

The risk of artificial sleep must be assumed by the person who is to be benefited, with the understanding that the anæsthetizer shall be qualified by actual practical experience and shall use all rational precautions and safeguards. When anæsthesia is induced for diagnostic purposes, the patient has a right to expect that the information thus elicited shall be final.

Chloroform is about ten times as dangerous as ether, but is to be preferred in the presence of renal insufficiency and in obstetrical practice. It is contraindicated in myocardial weakness and in very prolonged operations, but is again indicated in cases in which complete relaxation cannot be obtained from ether. It is administered by dropping it upon a mask or napkin from a drop bottle. Chloroform is not inflammable. When chloroform kills, the patient dies quickly. Chloroform anæsthesia can be made more safe by combining oxygen and chloroform by means of a special inhaler.

Ether is the safer anæsthetic in unskilled hands, but it may cause death some time after its administration, yet it is to be preferred as a rule in the presence of cardiac insufficiency. Its administration is accomplished by means of a cone made out of paper and a towel. Ether is highly inflammable.

Nitrous oxide and **ethyl bromide** are used for anæsthesia of short duration. The latter is administered by means of a napkin or chloroform mask.

Nitrous oxide is inhaled from a mask connected with an inflatable balloon and a gas tank. This anæsthetic is very safe, and is used in dentistry and for minor operations, and it may be given as a preliminary to ether or chloroform. No special apparatus is necessary for combined anæsthesia, but in skilled hands the Bennett inhaler gives excellent results.

Other *requisites for anæsthesia* are a mouth gag, a tongue forceps, a needle and silk for tongue traction, swabs securely fastened to long handles, a sterile hypodermic syringe, and needles.

Drugs to be used to combat circulatory failure: Strychnine, gr. $\frac{1}{30}$ to $\frac{1}{15}$, camphor in oil (1 to 15), gtt. x to xx, atropine sulphate, gr. $\frac{1}{150}$, whiskey, digitalis.

The necessary paraphernalia for enteroclysis, hypodermoclysis, and venous infusion should also be on hand.

Preliminaries to Anæsthesia.—Castor oil or a saline laxative should be given the evening before an operation if there is time, and an enema in the morning, before the operation. No food should be taken for six hours before the operation. Empty the bladder before the operation. Remove superfluous garments and false teeth. Place the patient in the recumbent position with the head low. Anoint the mouth, nose, and cheeks with vaseline. Instruct the patient to breathe deeply and regularly, and allow no talking until the patient is under the influence of the anæsthetic. Finally, the patient's extremities are to be placed in such a position as not to favor pressure paralysis.

To administer an anæsthetic skilfully requires practice, as no two individuals behave alike. Anæsthesia may be deep and profound or slight and superficial. Frequently the corneal reflex is abolished, but the muscles are rigid and the patient reacts to pain. Then it may become necessary to substitute chloroform for ether, or vice versa, or use a combination of both. The respiration is to be carefully watched, also the pulse. Stimulants may have to be employed during a lengthy anæsthesia, and in some cases it is well to inject morphine before administering the anæsthetic.

All these points are to be learned at the bedside and not from textbooks. Anæsthesia should imitate sleep and this should be accomplished with the least amount of the anæsthetic. A girl or woman should not be anæsthetized except in the presence of a third party, on account of the danger of erotic excitement. Mucous collections in the throat during anæsthesia are managed by turning the patient's head to one side and allowing mucus and saliva to gravitate out of the mouth. It may be necessary to use a mouth gag and swab for this purpose and to stop the anæsthetic until the danger from interrupted breathing is past.

Premonitory symptoms of vomiting may frequently be stopped by pushing the anæsthetic. Attacks of vomiting are managed very much like mucous collections in the throat. Interrupted breathing during anæsthesia is to be looked upon as a danger signal. In such instances the anæsthetic is to be laid aside, and the head lowered, the jaw pushed forward, and rhythmical traction of the tongue practised. Ammonia may be held to the nose and atropine sulphate or strychnine may be administered subcutaneously.

Local Anæsthesia

Local anæsthesia is accomplished by means of an ether or chloride of ethyl spray or by subcutaneous injection of a 2 per cent sterile solution of cocaine or eucaine in water.

Spinal anæsthesia is performed by injecting ¼ to ½ grain of sterile cocaine in solution into the subdural space in the manner described under Spinal Puncture. Spinal anæsthesia is to be used only in exceptional cases.

In Schleich's infiltration method, very weak solutions of cocaine and morphine are injected so as to thoroughly infiltrate the tissues to be cut.

Local anæsthesia for minor rectal operations by means of sterile water injections, which distend the tissues, is recommended by Dr. S. Gant, of New York.

A new local anæsthetic has been introduced by M. Fourneau, of Paris, under the name of *stovaine*, a synthetic product of the laboratory which gives the same results as an equal solution of cocaine and is decidedly less toxic. It is dissolved in distilled water, making a 1 per cent solution, of which from 15 to 30 drops are injected subcutaneously in neuralgia and for local anæsthesia.

INTOXICATIONS

POISONS AND ANTIDOTES

When poison has been swallowed, we should:

1. Endeavor to get rid of the poison.
2. Administer the antidote at once or as soon as possible.
3. Treat symptoms, such as collapse, burned surfaces, etc.

To provoke vomiting, use large quantities of warm water, at least a pint at a time. To this we may add ʒj of mustard, or ʒj of powdered ipecac, or ℥½ of the syrup of ipecac; insert the finger into the throat and adminster apomorphine, gr. $\frac{1}{12}$ to $\frac{1}{6}$, subcutaneously. For cases of unconsciousness where emetics fail, use the stomach tube.

Bland liquids are milk, raw eggs, oil, mucilage, gruel, barley water, condensed milk, etc.

The *alkaline* antidotes usually at hand are ammonia and water, soap, lime, whiting, soda, magnesia (Epsom salts), chalk, tooth powder, plaster, whitewash, wood ashes, lime water, etc.

The *acid* antidotes usually at hand are vinegar and lemon juice.

The *stimulants* usually at hand are whiskey, ammonia, tea, coffee, etc.

If the nature of the poison is unknown, provoke repeated vomiting, washing the stomach clean, without the tube if possible; give bland liquids, stimulate, and keep up breathing if necessary.

General Treatment

Acids, Sulphuric, Nitric, Hydrochloric, Oxalic.—Give an alkali (see above). Provoke vomiting; try to avoid the stomach tube; give bland fluids (ice cream); secure rest; relieve pain; stimulate if necessary; feed by nutrient enemata.

Hydrocyanic Acid and Potassium Cyanide.—Fresh air, an emetic, or the stomach tube; potassium permanganate; stimulate; give diluted ammonia water or chlorine water; cold effusions; atropine, gr. $\frac{1}{100}$, subcutaneously.

Carbolic Acid and Creosote.—Give Epsom salts, *strong alcohol*, dilute sulphuric acid, glycerine and oil; atropine subcutaneously, gr. $\frac{1}{100}$; emetics, apomorphine, gr. $\frac{1}{3}$ to $\frac{1}{2}$, the stomach tube if necessary; white of egg; amyl nitrite; stimulants; artificial heat; castor oil.

Alkalies, Ammonia, Soda, Potash, Lye, Chlorate of Potassium.—Give vinegar, lemon juice, orange juice, or other acids; fixed oils; bland liquids; secure rest; relieve pain; stimulate if necessary. Chlorate of potassium acts upon the heart and kidneys.

Arsenic, Paris Green, Scheele's Green, Fowler's Solution, Rat Poison.—Emetic or stomach tube; give hydrated oxide of iron (made by adding to a solution of the perchloride of iron, or the sulphate of iron, an excess of sodium carbonate (washing soda) or carbonate of potassium or magnesia, and filtering through a cloth); castor oil; secure rest; stimulate. Chronic arsenicism develops renal changes and paralysis.

Mercury, Corrosive Sublimate, Antimony, Tartar Emetic.—Emetics; lavage; give some infusion containing tannic acid; raw eggs and milk; bland liquids; castor oil; stimulate.

Copper Salts, Chronic Copper Poisoning among Artisans.—Albumen (milk, raw eggs); stomach tube; emetics; bland liquids. Symptoms of chronic copper poisoning: dyspepsia, anæmia, nervousness. In some of the manufacturing districts in Germany men work only three months a year in the glazing department by law.

Lead Salts.—Emetics or stomach tube; give Epsom salts or dilute sulphuric acid; milk, raw eggs, and water; relieve gastrointestinal pain; potassium iodide to help eliminate the drug. In chronic lead poisoning, there are blue gums, lead colic, constipation, and extensor paralysis.

Phosphorus, Matches, Rat Poison.—Provoke vomiting by repeated 5 gr. doses of sulphate of copper, the antidote; potassium permanganate solution, $\frac{1}{3}$ to $\frac{1}{5}$ per cent; give a saline purgative, but no oils nor fats. In chronic phosphorus poisoning, stomatitis and periostitis result.

Nitrate of Silver (Lunar Caustic).—Give strong salt and water; provoke vomiting; repeat many times, as it is antidote and emetic.

Iodine.—Emetics or stomach tube; starch and water; bland fluids; stimulate and relieve pain.

Opium, Morphine, Laudanum, Paregoric, Etc.—Emetic; stomach tube; potassium permanganate by the mouth or subcutaneously; ammonia; hot strong coffee per rectum; atropine subcutaneously; oxygen; keep awake; artificial respiration; lingual traction; amyl nitrite inhalation; interrupted current; use catheter and give rectal irrigation with warm saline solution.

Chloral Hydrate, Paraldehyde.—Emetic or stomach tube; artificial heat; massage; stimulate; strychnine; amyl nitrite; artificial respiration.

Nux Vomica, Strychnine, Picrotoxin.—Emetic or stomach tube, apomorphine, gr. $\frac{1}{4}$; animal charcoal or tannic acid; bromides and chloral; amyl nitrite; chloroform anæsthesia for convulsions; curare; artificial respiration.

Aconite, Veratrum Viride.—Emetic or stomach tube; stimulate; apply heat; atropine; artificial respiration.

Hemlock, Toadstool.—Provoke vomiting and give a purge; tannic or gallic acid; stimulate well; keep up the breathing.

Belladonna (Deadly Nightshade), Atropine, Hyoscyamus or Hyoscyamine, Duboisia or Duboisine, Stramonium or Daturine (Jimson, or Jamestown, Weed), Tobacco.—Emetic or stomach tube; stimulate; enema of hot coffee; artificial heat; morphine; pilocarpine; physostigmine; artificial respiration.

Alcohol, Wood Alcohol.—Stomach tube or emetic; ammonia and water; faradism; cold douche; cold applied to the heart.

Poisonous Gases, Carbonic Acid Gas, Sulphureted Hydrogen, Illuminating Gas.—Fresh air; oxygen; artificial respiration; amyl nitrite or nitroglycerine; stimulation.

Chronic Sewer Gas Poisoning.—Although workers in sewers are remarkably free from disease, it is generally believed that a prolonged exposure to noxious gas and the powerful odors from foul water may cause in acute types nausea, vomiting, colic, and fever, followed perhaps by collapse or coma. In more chronic forms there may apparently result a low form of fever with or without chills.

TREATMENT.—Remedy the drainage pipes or remove to sanitary surroundings.

Poison Ivy.—Œdematous erythema may spread over the entire body. Give a brisk cathartic. Apply lime water, lead water, or some simple ointment.

Ptomaine Poisoning, Poisoning from Meat, Pork, Sausage, Head Cheese, Beef, Veal, Mutton, or Fish.—From tainted or diseased meat, we observe vomiting, pain, and diarrhœa; it may simulate cholera; there may be wakefulness, delirium, headache, and changes in the pupils; the skin may show roseola, wheals, or urticaria; high fever or normal temperature; pulse accelerated or slow; thoracic oppression; patients may be prostrated; tendency to relapse; death may occur.

TREATMENT.—Symptomatic; make the patient drink warm water and induce vomiting; enemata, stimulants, baths.

Poisoning from Mussels.—Profound nervous symptoms, slight gastrointestinal disturbances; numbness, coldness, no fever, dilated pupils, rapid pulse; death may come in a few hours.

TREATMENT as for ptomaine poisoning.

Oysters and Lobsters Which Are Not Fresh.—Gastrointestinal poisoning, faintness, prostration, perhaps fever.

TREATMENT, that of ptomaine poisoning.

Poisoning from Milk, Ice Cream, Cheese, Etc.—Poisoning from milk is spoken of in the section on Pædiatrics (Cholera Infantum).

The various milk products, cheese, custard, ice cream, etc., may be very poisonous from ptomaines, and cause severe gastrointestinal symptoms.

The TREATMENT is the same as given above.

Grain Poisoning

Ergotism.—Meal may be contaminated with the ergot fungus, and its prolonged use will cause poisoning. There are two forms of intoxication. One begins with anæsthesia, tingling, and pains, in the toes and fingers usually, with spasmodic movements of the muscles, and a gradual stasis of the blood, terminating in gangrene. The other form shows nervous symptoms; the patient often complains from ten to fourteen days of headache and tingling sensations, possibly with slight fever and cramps in the muscles with contractures develop. The arms are flexed and the legs and toes are extended. These cramps come in spasms and may last from a few hours to many days. Relapses are frequent. Eclampsia develops in the most severe cases. Death may occur in a convulsion. Delirium may occur at first, and in chronic poisoning melancholia or dementia may result. Posterior spinal sclerosis may result from chronic poisoning with ergot.

Lathyrism (lupinosia) is a poisoning produced by using meal made from a grain popularly known as chick pea. It causes a spastic paraplegia involving the legs, which may proceed to complete paraplegia. India, Italy, and Algiers are the countries in which it has been noticed.

Pellagra (maidismus), a diseased condition found extensively in parts of Italy, France, and Spain, is supposed to be caused by using maize which has fermented or is diseased. At first there are indefinite symptoms, debility, pains in the back, sleeplessness, digestive disturbances, and sometimes diarrhœa. The pellagral erythema appears in the spring, and is followed by desiccation and exfoliation of the epidermis, which becomes very dry. Sometimes there is a suppurative process underneath the crusts. With these skin conditions there are digestive disturbances, salivation, dyspepsia, and diarrhœa, which may be hæmorrhagic. In the milder cases, after a few months recovery gradually takes place.

In the severe and chronic forms we observe backache, headache, spasms, paralysis, and mental disturbances. The paralysis affects the legs and may lead to paraplegia. Melancholia or suicidal mania may occur after several attacks, and there may result a profound cachexia.

TREATMENT.—The maize should be properly inspected and preserved. The patient should be removed from the infected district, and have a change of diet. Elimination and stimulation are indicated.

Various Poisons—Insect and Snake Bites

Pigments used in jellies and candies have produced poisoning.

Pigments in stockings and underwear may produce local eczema and constitutional symptoms. Early recognition is important. The treatment is symptomatic.

Preservatives, such as salicylic acid, boric acid, and formalin, have been used in foods in such large amounts as to cause intoxication.

Lead and tin, used in canning fruits, vegetables, etc., have also caused poisoning.

Flies have been known to carry infection to food which has communicated the disease to the person eating it. *Tuberculosis, cholera,* and *typhoid* *fever* have been contracted by eating food infected with the germs of these diseases.

The treatment is self-evident when the nature of the poison is known.

Snake Bites.—In this country there are few snakes, except the rattlesnake, the bites of which are poisonous. The poison of this snake, as well as that of others, does not affect one if swallowed, provided there are no abrasions in the mouth, but if it enters the circulation it is very poisonous. We observe dyspnœa, cramps, bloody diarrhœa, hæmorrhage from the nose and lungs, asphyxia, paresis, and paralysis, which may be fatal by affecting respiration and circulation.

Immediately after the bite, if the wound is sucked by the human mouth, much of the poison can be removed. We may apply the actual cautery, make deep incisions, and apply a 5 per cent solution of carbolic acid, but this is useless, unless done immediately.

Internally, alcohol in large amounts is very effectual. The person bitten can tolerate an immense amount, and we can only determine when to stop its administration by the appearance of the symptoms of alcohol intoxication. Antitoxine for snake bites (antivenine) will be available in the near future.

Insect Bites.—PEDICULI.—The *Pediculus capitis*, or head louse, the *Pediculus corporis*, or body louse, and the *Pediculus pubis*, or crab louse, may cause by their bites small hæmorrhagic spots or an urticaria. In cases of long standing induration and pigmentation may be produced from the bites and from scratching.

Treatment.—For the head louse, when the condition is bad, it is best to cut the hair short, as it is very difficult to destroy the nits. Repeated washings in coal oil or turpentine or carbolic acid, 1 to 50, are usually sufficient.

For the body louse, the clothing should be baked or steamed in an oven or sterilized for several hours. The itching of the skin can be allayed by a warm bath containing 4 or 5 oz. of bicarbonate of sodium. A lotion of carbolic acid, about .02 per cent with 2 oz. of glycerine, is helpful.

The PUBIC LOUSE may be destroyed with ordinary blue ointment or white precipitate ointment. The parts should be thoroughly washed two or three times a day with soft soap and water.

BED BUGS may cause in some people very great distress from the local poisoning. Bichloride of mercury, kerosene, or sulphur fumigation usually destroys them in the cracks of beds or walls, where they secrete themselves. They probably can carry an infection from one person to another.

MYIASIS.—This term is given to wounds or scars in which the larvæ of certain flies develop, making it "living." It is not common in temperate climates. The invasion is rare, unless a region is previously diseased. We find them in the nose, ears, conjunctivæ, vagina (after delivery), etc. They can be removed by forceps or by thorough cleansing and antiseptic applications.

The STING OF BEES, WASPS, HORNETS, and SPIDERS is followed by acute pain and considerable local swelling.

Treatment.—Cold lead water should be applied locally. An incision into the swollen tissues is occasionally necessary to relieve tension.

DRUG HABITS

Morphine, cocaine, and chloral, all anodynes and used at first to relieve pain, are the most common drugs to which people become addicted.

The treatment of the morphine habit is to gradually withdraw the drug, and it is always best to do this in a trustworthy institution with reliable attendants, so that the patient is never alone. As aids, we should give good food and plenty of it, and build up the general health. Coffee and alcohol in small amounts as stimulants may be helpful. As counteracting drugs, *dionin*, subcutaneously or by mouth, in doses double that of the morphine, may be tried. *Codeine* is also helpful, but the bromides are of little use. In collapse we may need alcohol and sometimes more morphine. Hydrotherapeutics is helpful.

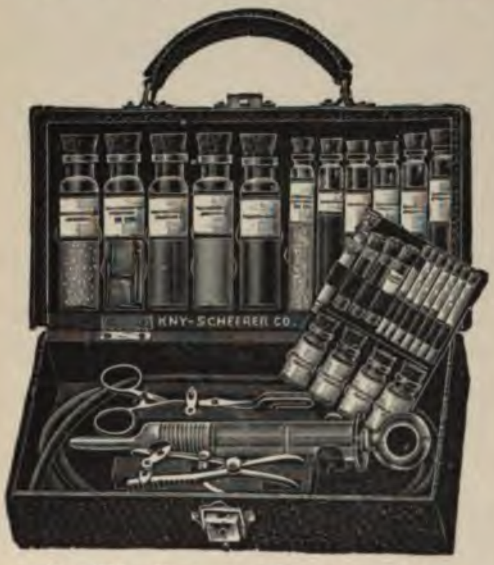


FIG. 225.—EMERGENCY POISONING CASE.

The **cocaine** habit is very difficult to overcome, and its victims are most pitiful. It is best to take the patient to an institution and withdraw the drug. It is probably best to do it gradually. Great excitement follows its discontinuance, and even paranoia. Alcohol and morphine are sometimes indicated during the treatment.

Chloral may produce serious symptoms in those addicted to it. It may cause dyspnœa and even death by bronchial effusion. Eruptions on the skin are common and there is a tendency to skin eruptions upon the slightest provocation. It is said also to cause in chronic cases petechiæ, ecchymoses, and ulcerations. General œdema, profound weakness, and heart failure may result.

TREATMENT.—Withdrawal of the drug.

An emergency poisoning case should form part of the armamentarium of the physician. Dr. J. W. Wainright, of New York, has suggested such a case with the following contents:

One stomach tube, one tongue forceps, one mouth gag, one 2-oz. glass syringe, one hypodermic syringe. It also contains five 2-oz. bottles of magnesium sulphate, of zinc sulphate in 20-grain powders, powdered mustard, calcined magnesia, and chloroform. The 1-oz. vials contain amyl nitrite, alcohol, iron dialyzed, acetic acid, oil of turpentine, and aromatic spirit of ammonia. The ½-oz. vials contain powdered ipecac, powdered opium, potassium bromide, chloral hydrate, and potassium permanganate. The hypodermic tablets are of strychnine sulphate, morphine sulphate, pilocarpine muriate, apomorphine, hydrochlorate, nitroglycerine, digitalis, and atropine sulphate.

ALCOHOLISM

We recognize two forms of alcohol poisoning, the acute and the chronic.

The **acute intoxication** is familiar to every one, but we should always try to distinguish it from intracranial hæmorrhage and cerebral concussion when the patient is comatose. This is exceedingly difficult, as nothing is positively diagnostic when the condition of coma exists (see Coma).

TREATMENT.—Evacuate the stomach, employ warmth to the extremities, apply an ice bag over the heart, use artificial respiration, and give 10 drops of aromatic spirit of ammonia in water.

Chronic alcoholism is sooner or later accompanied by tissue changes in different parts of the body. A chronic proliferative inflammation of the stomach, liver, blood vessels, heart, and kidneys may finally result. Cirrhosis of the liver is a diseased condition frequently due to alcohol. Amaurosis, neuritis, epilepsy, tremor, delirium tremens, and general paresis may result. Persons who cannot use alcohol moderately *must not use it at all.* In breaking away from alcohol the patient should be allowed to take beef tea and drug stimulants, such as strychnine, phosphorus, the bromides, and bitter tonics.

MISCELLANEOUS AILMENTS

SEASICKNESS (MAL DE MER)

Sickness caused by the motion of a boat, with its effect upon the brain and probably upon the semicircular canals of the inner ear and its accompanying gastrointestinal toxæmia, is a most distressing condition, and one most difficult to treat. Many remedies have been advocated, but most of them are ineffectual or only partly effective. For several days or a week before sailing, it is advisable to put one's self in as good physical condition as possible, regulating the diet and looking after the bowels. The diet should be *plain,* easily digestible, and not constipating. For three days before sailing from 30 to 60 gr. of sodium bromide a day, in divided doses, should be taken, and the use of the drug continued in slightly smaller doses during the voyage. It may be used in combination with strychnine, gr. $\frac{1}{30}$ ter in die. Chloral, hyoscyamine, and atropine are also helpful.

During the voyage the diet should not be rich or constipating. One should be upon deck as much as possible, facing the wind. A cold bath daily and a daily cathartic if necessary are helpful. The prone position, with the head slightly lower than the body, gives some relief. Ice, lemon juice, or cold champagne or matzoon sometimes allays the nausea. *Mental suggestion* is very helpful. When *treatment* is unavailing the patient should rest in a horizontal position.

Although no deaths have been actually recorded as due entirely to seasickness, it has occasionally fatally aggravated hyperemesis gravidarum, and not infrequently its effects may be very bad and may last some days after a voyage is ended.

A stateroom amidships on the promenade deck, where the motion is least and no kitchen smell is noticed, is advocated. If one looks away upon the horizon, and does not watch the motion of the ship or water, one is less apt to be sick.

MOUNTAIN SICKNESS

Upon reaching a great altitude, 10,000 feet or higher, one is likely to have a headache, nausea, dizziness, and gasping for breath. The throat becomes very dry, the thirst is intense, the appetite is lost, and there may be severe malaise. The temperature may be slightly elevated. The symptoms may last for several days.

HYDROPHOBIA (RABIES; LYSSA)

This acute specific disease of certain animals can be communicated to man by inoculation, usually through a bite. It is as old as the history of medicine and was known to the Greeks as lyssophobia.

Ætiology.—Most warm-blooded animals are susceptible to this disease, but we see it oftenest in the dog, wolf, cat, skunk, and fox. The poison is found in the nervous system and in the secretions, particularly the saliva. In this country we are usually inoculated through the bite of a dog. The saliva of a rabid dog, touching an abrasion, is also likely to infect. Bites upon parts uncovered by clothing are most apt to produce the disease.

The incubation period varies from twenty days to two months, but may be as short as two weeks and as long as several months.

Pathology.—Little is found. Sometimes we find congestion and minute hæmorrhages in the spinal cord.

Symptoms.—The symptoms may be divided into three stages:

PREMONITORY STAGE.—Irritation, pain, or numbness occurs about the bite. Depression, melancholia, headache, and loss of appetite follow, with irritability, sleeplessness, and a sense of impending danger. The special senses are abnormally acute. This stage lasts about a day.

SPASMODIC STAGE.—There is a spasm of the muscles of deglutition whenever the attempt is made to swallow. Dyspnœa and the making of odd sounds (so called barking) occur when the spasm spreads to the laryngeal muscles and those of respiration. Later, these spasms may be produced by any afferent stimuli, such as draughts of air, sounds, or even suggestion. Any or nearly all of the muscles of the body may be attacked by the spasms. Maniacal symptoms may be present. Profuse salivation is usual. The temperature may be as high as 103°, although sometimes it is normal or subnormal. Prostration becomes more marked after each spasm, and death may occur from asphyxia while the patient is in a spasm. Usually this stage lasts from one to three days.

The PARALYTIC STAGE follows, and may last from six to eighteen hours. The patient becomes quiet, the spasms cease, unconsciousness gradually develops, the heart's action becomes feeble, and death occurs in syncope.

Differential Points.—In mania with fear of water there are no tonic or clonic convulsions. In tetanus the cause is a wound and not a bite, the period of incubation is short, and there is no dribbling of saliva, etc.

Treatment.—Prophylaxis is our only hope, as when the disease has begun it is invariably fatal. Muzzling of dogs should be insisted on. After a person is bitten, a ligature should be applied to the proximal side, and the wound energetically cupped or sucked by one whose mouth has no abrasions or carious teeth or, better, with a suction pump. Immediate excision of the wound, with vigorous disinfection, has given good results. Preventive inoculation during the period of incubation with virus made from the nerve tissue of infected animals, by the process devised by Pasteur, has been effectual in reducing the mortality of hydrophobia. After the disease has begun, morphine and chloroform may make the patient more comfortable.

SEPTIC WOUNDS AND TRAUMATIC TETANUS

A clean wound, unless protected by aseptic or antiseptic dressings, may become infected from the germs in the air or from unclean or infected surroundings, and suppurate. A general or local infection may result, which usually demands surgical treatment.

Tetanus is a wound infection with the bacillus of tetanus (Nicolaier). Tetanus of the new-born is fully described in the Pædiatric chapter of this book. Tetanus in the adult is the result of a traumatic, usually a contused or irregular wound, soiled with earth or foreign matter (toy pistol wounds). Preventive treatment, serum therapy, is indicated whenever one encounters such a suspicious wound as is described above. *Tetanus antitoxine*, as now furnished, is administered hypodermically in doses of 10 c.c., which may be repeated. The wounds should be incised, curetted, and swabbed with pure carbolic acid, in addition.

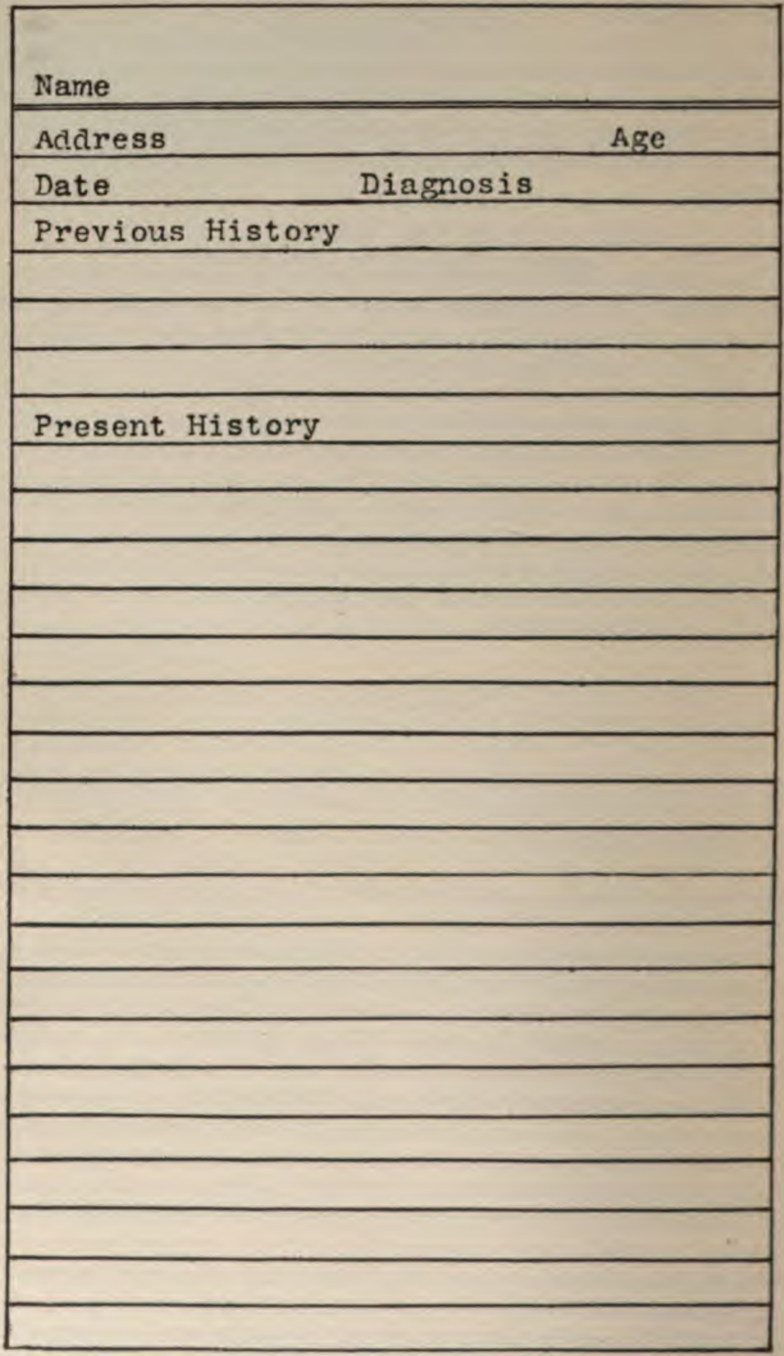
THE KEEPING OF RECORDS OF CASES UNDER TREATMENT AND THEIR ACCOUNTS IN PRIVATE PRACTICE

THE value of keeping careful records of all cases treated may be demonstrated in many ways. Not only does it give an added interest while the case is under treatment, but a written account of the course of the disease, with its interesting points put down as they appeared and the medication prescribed, is important both as a means of bringing the case quickly before the mind and as a source of valuable data in case of a question of law.

Any system, to be entirely successful, must be economical of space and yet provide an arrangement which makes it possible to put down all points connected with the case, whether they relate to medication or any sudden change in the condition. The record should not be too brief, or it will lose all value when studied afterward. It must be just brief enough to be entirely comprehensive and to include all points connected with the case as they arise.

In hospitals or in private practice where a trained nurse is in attendance, the opportunity for keeping a complete record is provided by the systems in use, but in private practice, where the physician can depend only upon himself, another method must be devised.

The following system, which combines not only the recording of the history and the course of the disease and its treatment, but also a ledger



Name

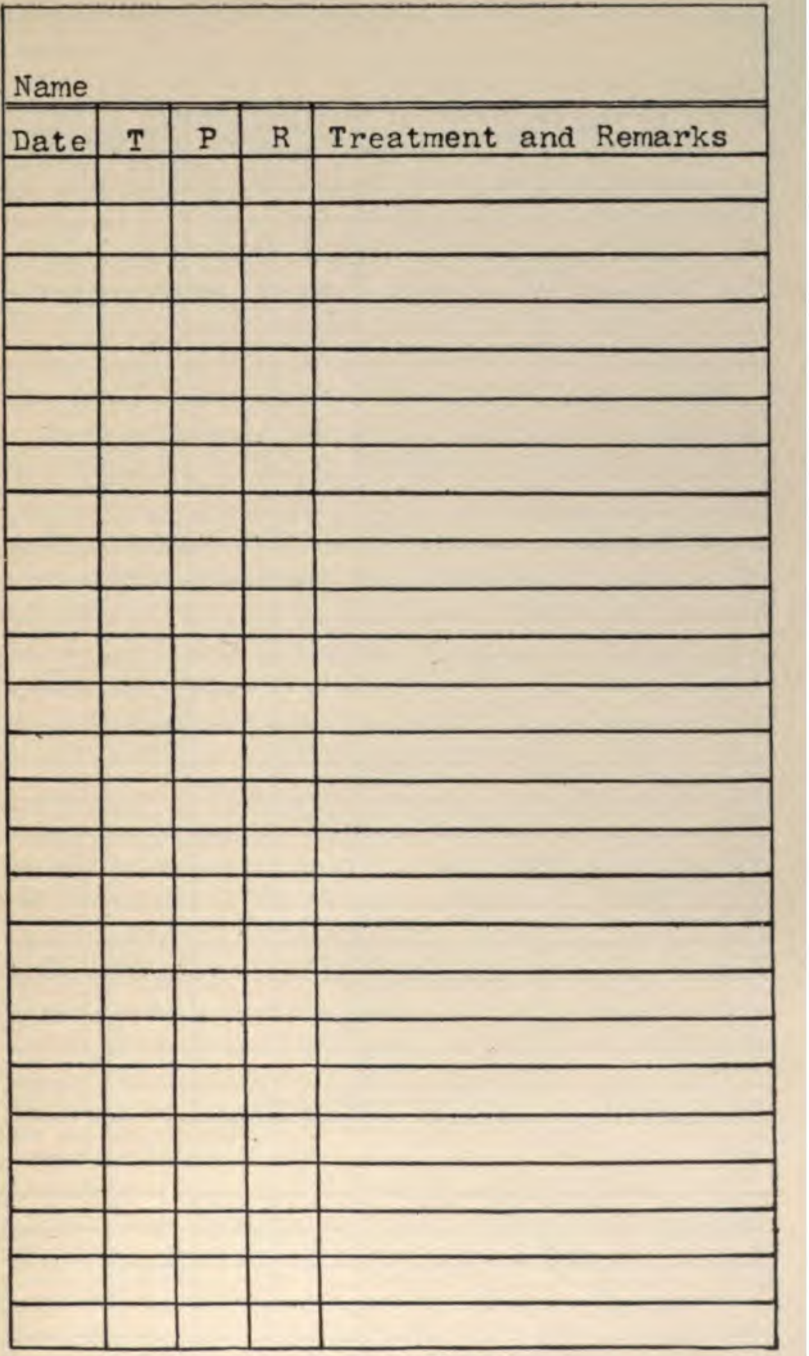
Address Age

Date Diagnosis

Previous History

Present History

FIG. 226.—CASE RECORD.



Name

Date	T	P	R	Treatment and Remarks

FIG. 227.—CASE RECORD.

Name

	Jan	Feb	Mch	Apr	May	Jne	Date	Due	Paid	Bal'ce
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3										
4										
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FIG. 228.—DAY-BOOK AND LEDGER. SIZE 4 x 7.

The other side is similar, except that the columns are marked from July to December.

for the account of each patient, is intended for the use of physicians among their patients where no trained nurse is employed, and where he himself is taking the temperature, pulse, and respiration and is doing all the nursing outside of the ordinary care of the patient. The so called card system is employed, and there is provided a card for the recording of the history of the case, both as to the condition of health and as to the diseases in the past and the symptoms of the present illness. The card is ruled on both sides, so that the history may be carried over on to the back (Fig. 226).

Another card, "the bedside notes," is provided, which is so ruled as to make it possible to jot down upon each visit the date, hour, temperature, pulse, and respiration, the medication ordered, the condition of the patient, and any other notes that may be of value (Fig. 227). This card may be carried in the pocket or in the physician's bag and referred to when the visit is made, or it may be left in the patient's room and taken away at the last visit. These two cards are all that are necessary to keep a full record of each case, and if the notes are written down at the bedside, they are thereby rendered authentic and make a valuable history of the case. A tin box of a proper size to fit the cards is necessary for the filing of the completed records and for their easy reference. This box should contain a set of alphabetical index guide cards, and each history with its set of bedside notes should be placed behind the guide card bearing the initial letter of the patient's name. Subsequent histories and notes of patients with the same initial letter are placed behind this. This makes a complete, compact arrangement, and if the tin box is japanned or is made of quartered oak, it makes a very acceptable bit of office furniture.

To this system may easily be added the keeping of the account of each patient, thereby doing away entirely with the bulky day book and ledger at present used. A card is provided similar to the one shown in Fig. 228. Both sides of the card are used, the one side for the accounts of the first six months, and the other for the last six months of the year. It is so ruled that the fee for each visit may be written down. At the end of each month the amount is summed up at the bottom. On the right half of the card are ruled spaces for the credit side of the account. The first space is for the noting of the date upon which the bill is sent out, the amount of the bill up to that date being placed in the second column. When the bill is paid, the date is placed in the first column and the amount paid in the third column. If any balance remains due, this is placed in the last column on the same line with the amount paid. When the next bill is sent out, this balance is added to any new account and placed in the second, or "Due," column. If the account is entirely paid up, no figure will appear in the balance column. The card will contain the account of each patient for one year, and is placed in the box directly in front of the history card.

This system makes the keeping of accounts concise and complete, for it not only places every item in plain view on one page, but it does away with all books. The small book now used for the recording of each visit or prescription, which record is later copied into a day book, is made unnecessary by this system, for the bedside note card is the index for each visit made, the day and hour being written there. The fee for the visit is placed in the column corresponding to the day and month, and at the end of the month these are summed up. When payments are made, they are placed on the credit side of the card. This card, therefore, becomes a combined day book and ledger, and one card serves the purpose of three books.

Therefore, the history of the disease, the record of its symptoms, course, and treatment, and the patient's account are brought compactly under one head, and, if arranged alphabetically in a tin or oak box, make a perfect system, accurate and easily available for examination.

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